Model PM4-TR
Panel Mount Display/Controller
Ratemeter/Totaliser
Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the PM4-TR Monitor. The instrument may be set to operate as a ratemeter or totaliser or allow toggling between rate and total displays. The **SEt OPEr** function (see section 7.66) allows selection of one of these three modes. The three modes of operation are:

- **totL** - totaliser/counter display. The input pulses are totalised, scaled in engineering units and displayed e.g. Total litres, mm etc. Count up or count down is possible. A total and grand total may be viewed and reset separately. The grand total is a separate total memory which allows storage of all the previous totals, alternatively the grand total can be used to store the number of batches. Explanation and examples of the totaliser functions are given in the "Totaliser Explanation of Functions" chapter. The totaliser is scaled via the **totL InPt** (see section 7.35) and **totL SCLE** (see section 7.36) functions.
- **FrEq** - frequency/rate display. The frequency or rate of the input may be scaled in engineering units and displayed e.g. R.P.M, Bottles/min., Litres/hour etc.. For low frequency inputs (input always below 1kHz) there is an option of displaying either rate or period. Explanation and examples of the ratemeter functions are given in the "Ratemeter Explanation of Functions" chapter. The ratemeter is scaled via the **rAtE InPt** (see section 7.29) and **rAtE SCLE** (see section 7.30) functions.
- **both** - total/rate display (display may be toggled to either total or rate). This mode is primarily used when the display is required to toggle between a rate and total display via an external contact closure or via the front panel ⏶ and ⏷ buttons (only fitted on certain display options). For low frequency inputs (input always below 1kHz) there is an option of toggling between rate/total or rate/period. A total and grand total may be viewed and reset separately. Explanation of the totaliser functions and setup examples are given in the "Both Mode Explanation of Functions" chapter.

Selection of operating mode, calibration and scaling are all accomplished by push button operation (see page 26 for details). Display prompts are given for each function to assist in setting up the instrument. Changes to input sensor type or optional outputs may require dismantling the instrument to alter PCB links.

An inbuilt relay provides an alarm/control function, optional relays (giving up to 7 in total), optically isolated analog (single or dual channel), serial or digital (BCD or binary) re-transmission and isolated excitation voltage may also be optionally provided. The single analog output option can be set for retransmission or PI rate control. The dual analog output option allows output 1 to be set for PI or retransmission, the second output can be set for retransmission only.

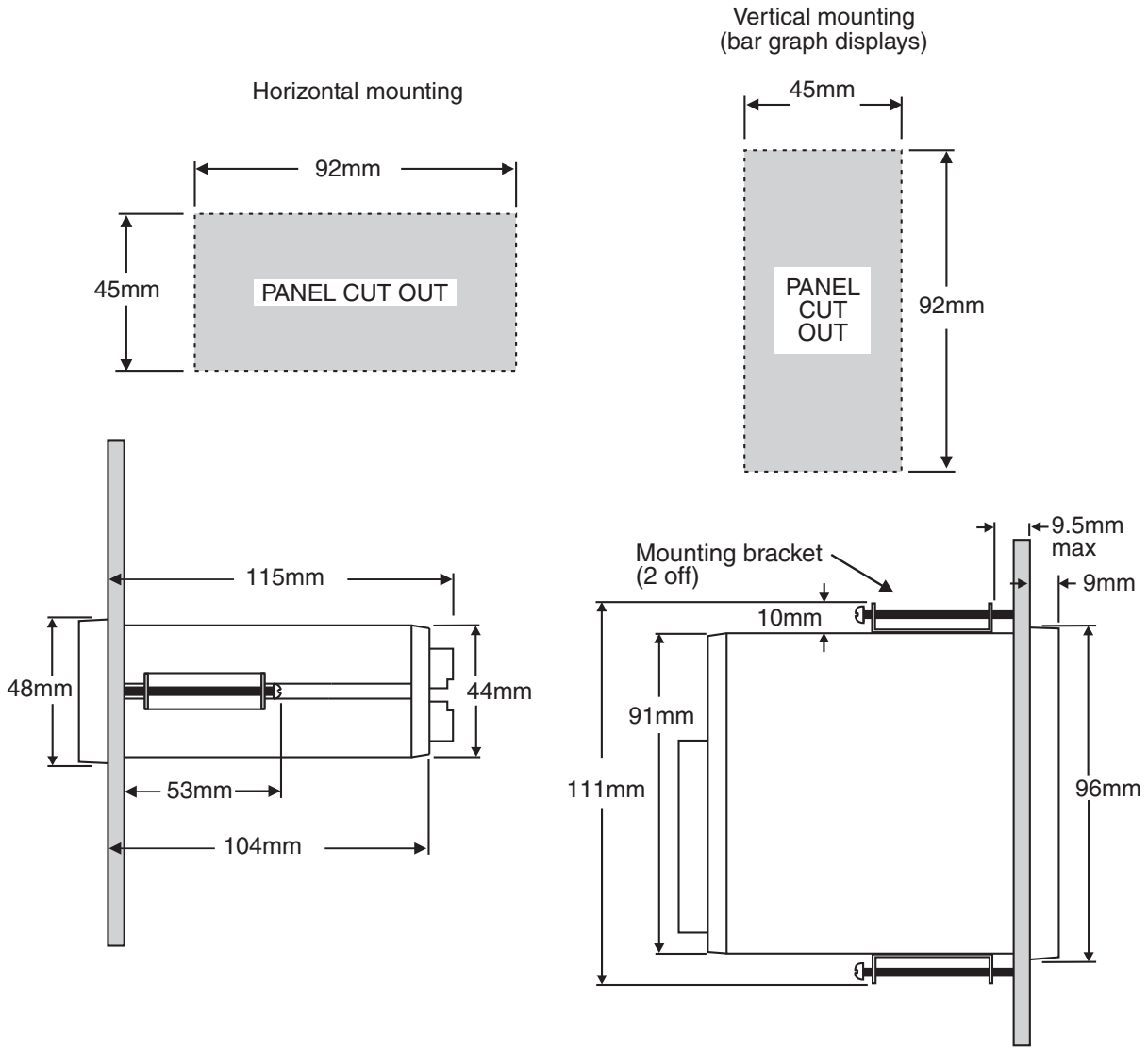
Unless otherwise specified at the time of order, your PM4 has been factory set to a standard configuration, see the function table for your selected mode for default settings. Full electrical isolation between power supply, input voltage and re-transmission output is provided by the PM4, thereby eliminating grounding and common voltage problems. This isolation feature makes the PM4 ideal for interfacing to computers, PLCs and other data acquisition devices.

The PM4 series of Panel Mount Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels.

2 Mechanical Installation

Choose a mounting position as far away as possible from sources of electrical noise such as motors, generators, fluorescent lights, high voltage cables/bus bars etc. An IP65 or IP67 access cover which may be installed on the panel and surrounds is available as an option to be used when mounting the instrument in damp/dusty positions. A wall mount case is available, as an option, for situations in which panel mounting is either not available or not appropriate. A portable carry case is also available, as an option, for panel mount instruments.

Prepare a panel cut out of 45mm x 92mm +1 mm / – 0 mm (see diagram below). Insert the instrument into the cut out from the front of the panel. From the rear of the instrument fit the two mounting brackets into the recess provided (see diagram below). Whilst holding the bracket in place, tighten the securing screws being careful not to over-tighten, as this may damage the instrument. Hint: use the elastic band provided to hold the mounting bracket in place whilst tightening securing screws.



3 Electrical installation

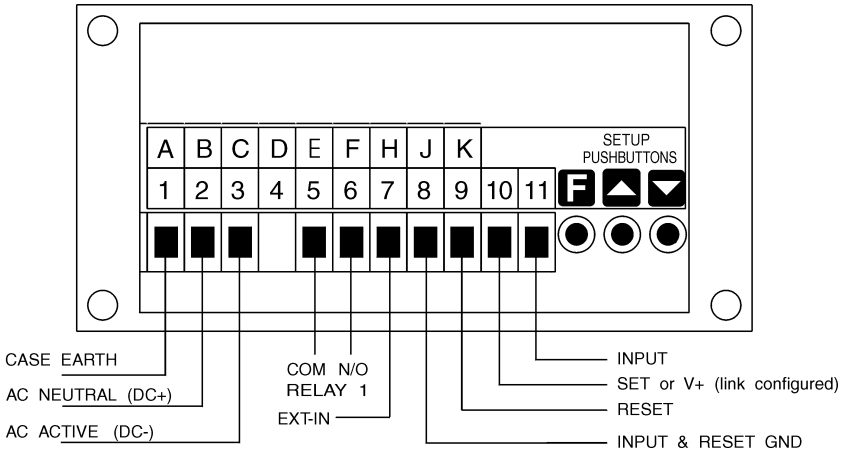
3.1 Electrical installation

The PM4 Panel Meter is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing.

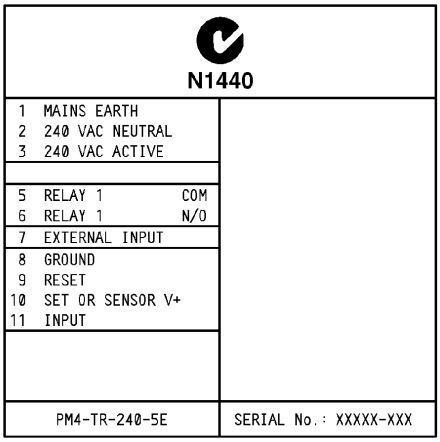
The plug in, screw type, terminal blocks allow for wires of up to 2.5mm^2 to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to connection details provided in this chapter to confirm proper selection of voltage, polarity and input type before applying power to the instrument.

When power is applied the instrument will cycle through a display sequence indicating the software version and other status information, this indicates that the instrument is functioning. Acknowledgement of correct operation may be obtained by applying an appropriate input to the instrument and observing the reading. The use of screened cable is recommended for signal inputs.

For connection details of optional outputs refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when options are fitted.

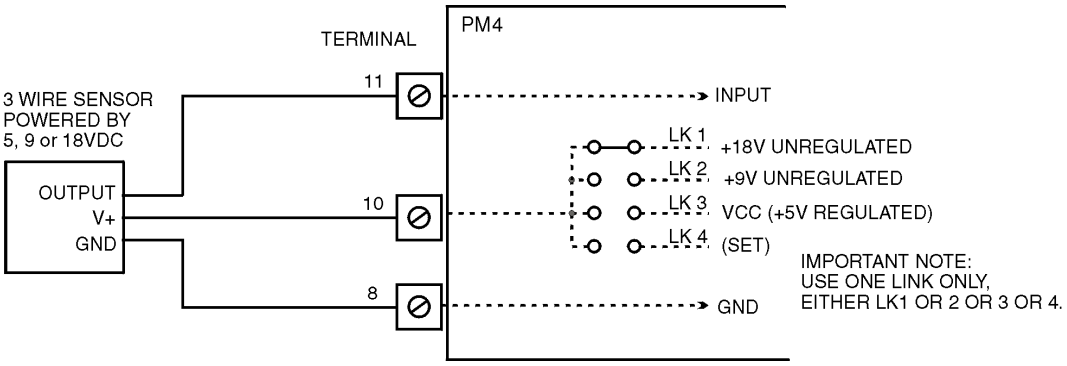


Instrument data label example



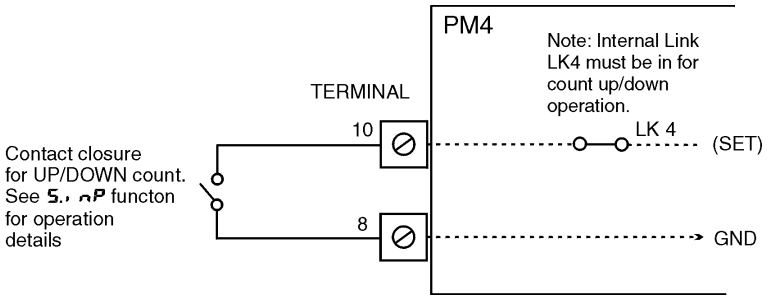
3.2 Transducer power supply

The standard internal power supply may be link selected to provide a regulated 5V or unregulated 9V or 18V to power the sensor. The maximum current available is 25mA. The 9V and 18V unregulated supplies are only available on the AC powered versions of this panel meter. Note that no more than one link should be fitted in LK1 to LK4 i.e. either LK1 or LK2 or LK3 or LK4.



3.3 Count up/down operation

The SET input may be used in up count/down count operation of the totaliser. Control of mode of operation is via the **S.I nP** function and via the state of the SET input (open circuit or short circuit to ground via link or contact closure). See **S.I nP** function for description and operation table.



3.4 Relay connections

The PM4 is supplied with one alarm relay as standard with connections on terminals 5 and 6, extra relays are optionally available. The relay is a single pole, single throw type and is rated at 5A, 240VAC into a resistive load. The relay contact is voltage free and may be programmed for normally open or normally closed operation. The relay will close when power is removed.

3.5 WS-03102 and Rotapulse wiring and link settings

WS-03102 anemometer and Rotapulse flowmeter are commonly supplied with this model. Wiring and link settings are as shown below:

WS-03102: Wiring - Anemometer WS REF terminal to PM4-TR GND terminal 8 and WS SIG terminal to PM4-TR IN terminal 11. Shield to LD-TR GND terminal 8.
Input link settings: Links in are LK8 (DC), LK5 (LOWF), LK12 (FREQ) all other links are out.
Suggested settings:

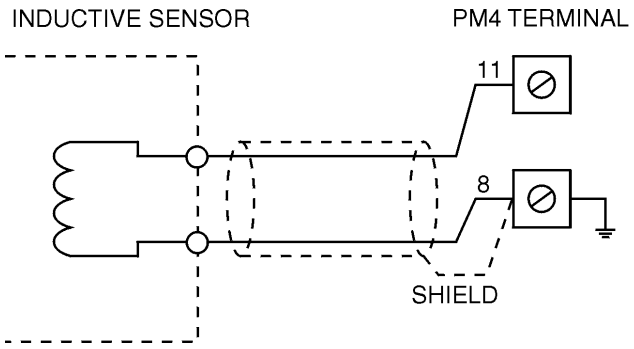
FrEq rnGE = LoF, t.out SECS set as required.
For kph scaling rAtE 1 nPt = 30, rAtE SCLE = 82.0
For m/s scaling rAtE 1 nPt = 30, rAtE SCLE = 22.8

Rotapulse: Colour code: Black - signal + (terminal 11), Brown - +18V (terminal 10 on AC powered models), Blue - ground (terminal 8). Input link settings: Links in are LK1 (18V), LK6 (VCC), LK8 (DC), LK9 (BIAS), LK10 (HYST) all other links are out.

3.6 Ext In (Remote input) connections

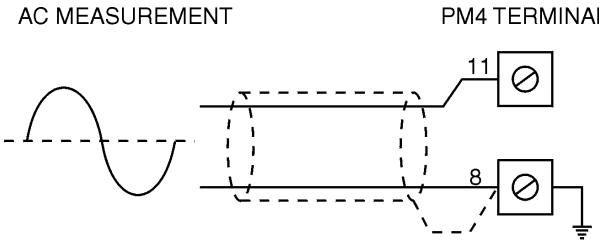
The remote input connections are across terminals 7 and 8. A momentary or latching switch can be fitted across these terminals to suit the operation selected at the r.1 nP function.

3.7 Input connection and internal link settings



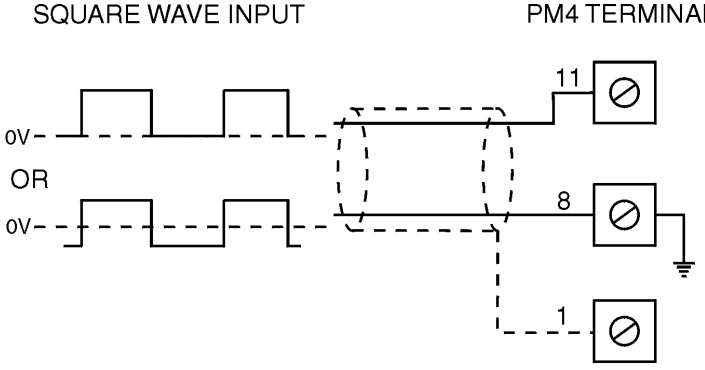
Inductive sensor AC output (48V RMS max)
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	See Notes
LK8	DC	In
LK9	BIAS	Out
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	See Notes



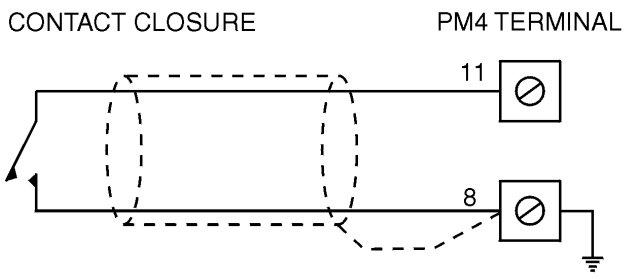
AC input (48V RMS max}
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	See Notes
LK8	DC	See Notes
LK9	BIAS	Out
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	See Notes



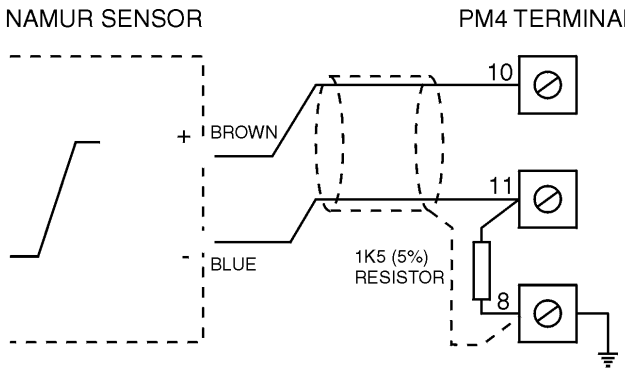
Square wave
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	See Notes
LK8	DC	In
LK9	BIAS	See Notes
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	Out



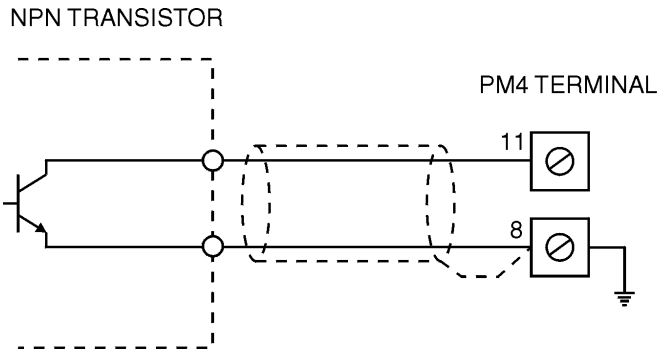
Voltage free contact closure
Typical internal link settings

LK5	LOW FREQ	In
LK6	VCC	In
LK7	GND	Out
LK8	DC	In
LK9	BIAS	In
LK10	HYST	In
LK11	HYST2	Out
LK12	FREQ	Out



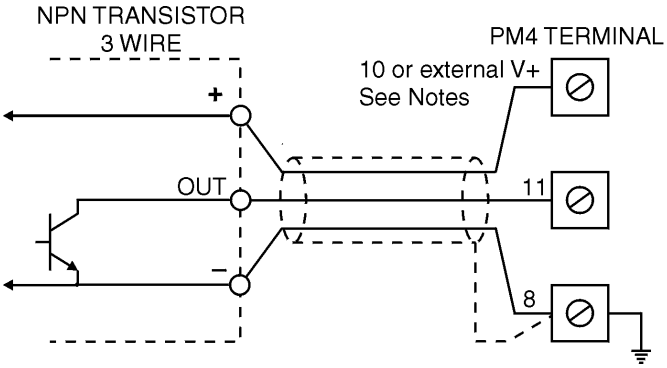
NAMUR Sensor
An external resistor is required for this input type as shown.
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	In
LK8	DC	In
LK9	BIAS	In
LK10	HYST	In
LK11	HYST2	Out
LK12	FREQ	Out



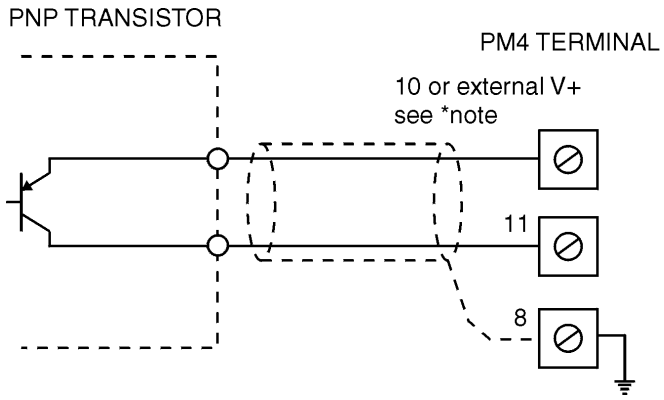
NPN Transistor 2 wire
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	In
LK7	GND	Out
LK8	DC	In
LK9	BIAS	In
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	Out



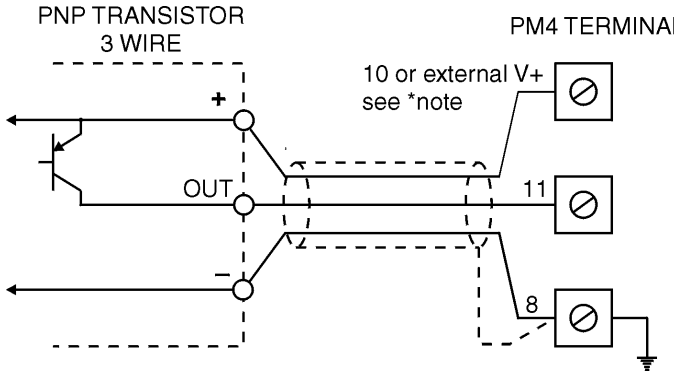
NPN Transistor 3 wire
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	In
LK7	GND	Out
LK8	DC	In
LK9	BIAS	In
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	Out



PNP Transistor 2 wire
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	In
LK8	DC	In
LK9	BIAS	In
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	Out



PNP Transistor 3 wire
Typical internal link settings

LK5	LOW FREQ	Out
LK6	VCC	Out
LK7	GND	In
LK8	DC	In
LK9	BIAS	In
LK10	HYST	See Notes
LK11	HYST2	See Notes
LK12	FREQ	Out

3.8 Notes

HYST2 link should be in for signals between 1V and 5V amplitude (low level of the input pulse must be below 0.5V). HYST link should be in for signals greater than 5V amplitude (low level of the input pulse must be below 2V). If the input pulse amplitude is between 100mV to 1V both HYST and HYST2 links can be taken out but the input will be at its highest sensitivity and will be more prone to interference due to electrical noise and it therefore not normally recommended. A maximum of one hysteresis link should be fitted.

The DC coupling link should be in for frequencies less than 10Hz.

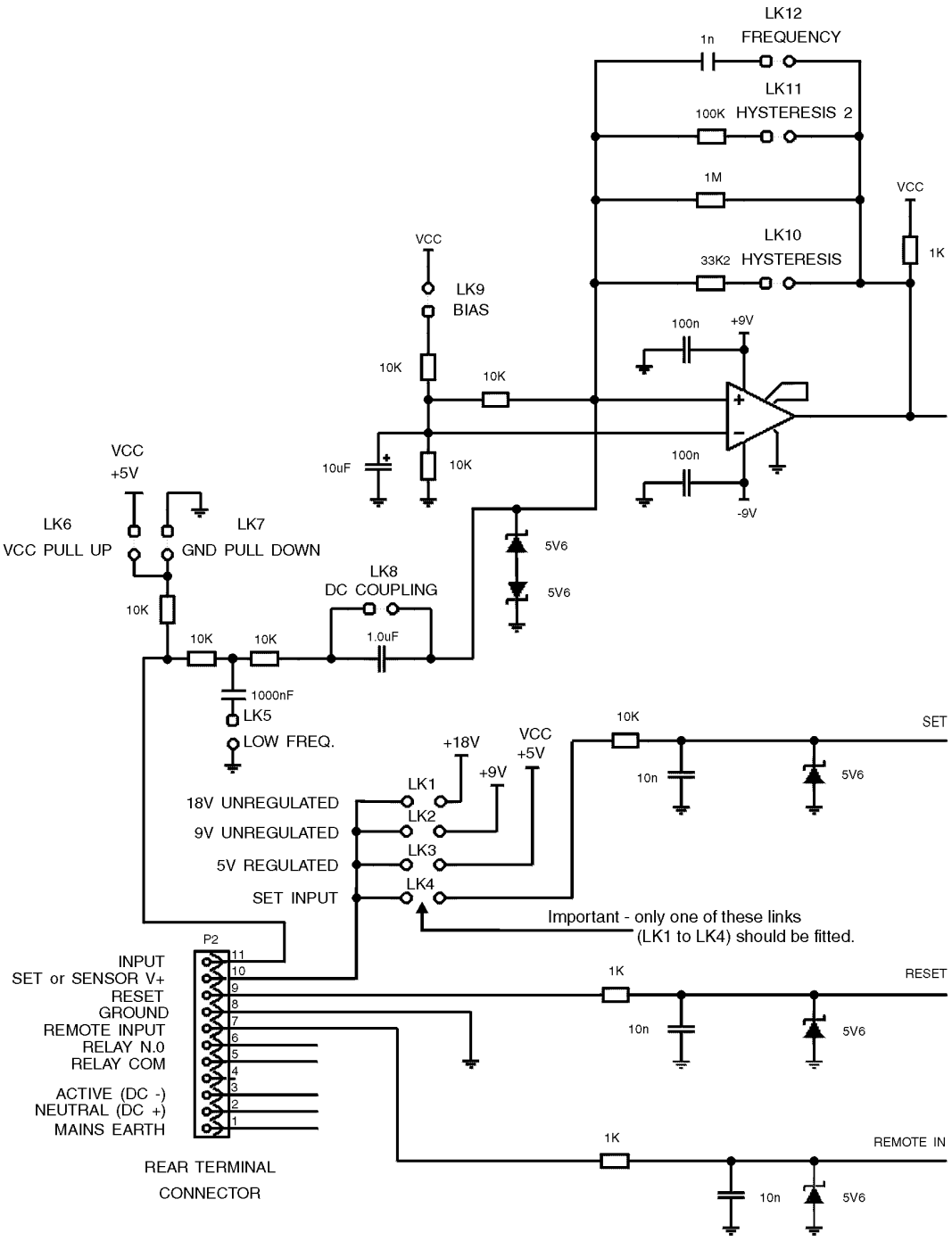
The BIAS link should be in when input signal does not go below 0V.

For inputs above 24V (48VDC or RMS max.) both the VCC and GND link should be out.

The FREQ link should generally be left out. It can used when the display is having difficulty registering sinewave AC inputs. If at high frequency (above 10kHz) and with input signals above 2VRMS difficulty is found in obtaining a stable display this link can be tried and it may in some circumstances help to stabilise the display.

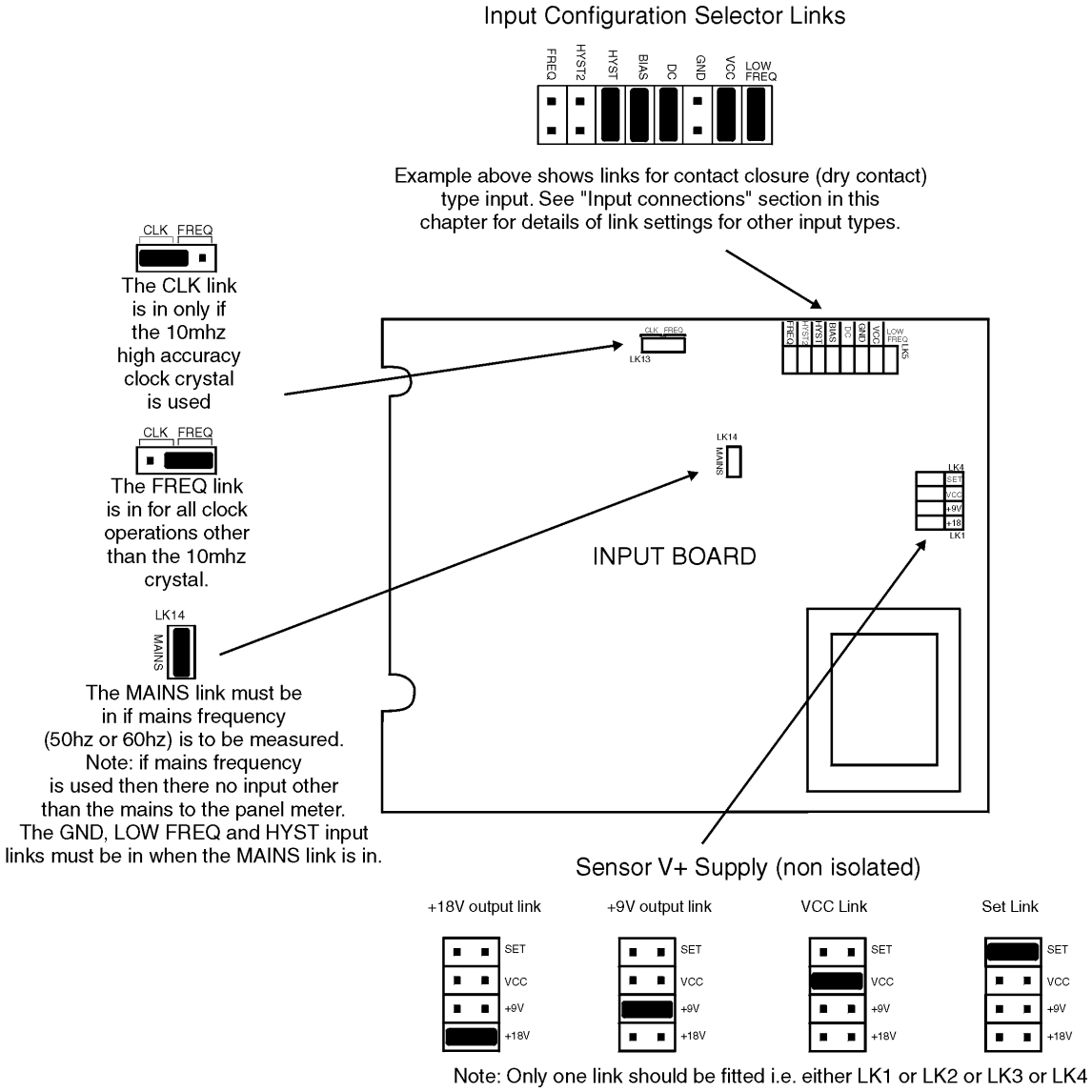
The LOW FREQ link is generally used for filtering out contact bounce when relay or switch contacts are used. It can however be used with other input types to filter out high frequency noise provided that the maximum input frequency of the pulse signal is less than 80Hz.

3.9 Input circuit diagram



3.10 Configuring the input board

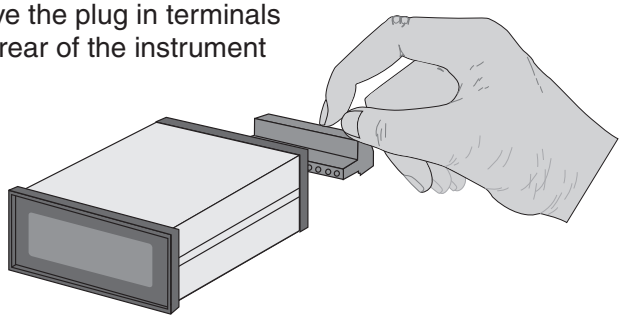
Link settings are only required for mains synchronisation. Dismantle the instrument as described in “Input/output configuration”. Insert the links into the appropriate location on the pin header.



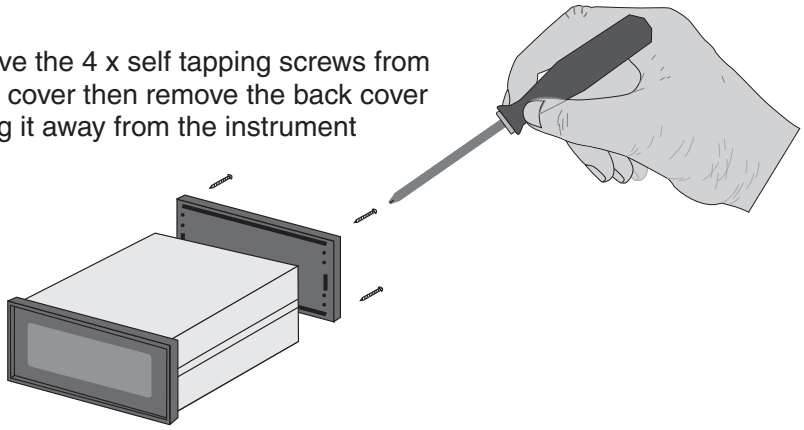
3.11 Input Output Configuration

If you need to alter the input or output configuration link settings proceed as follows:

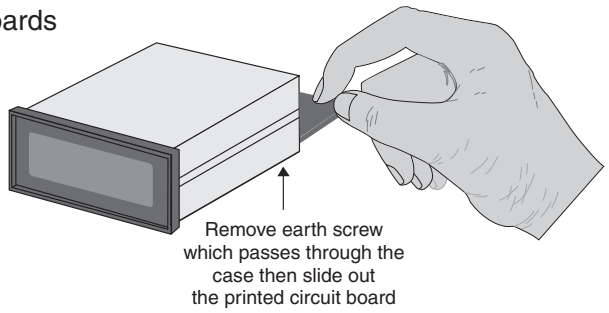
1. Remove the plug in terminals from the rear of the instrument



2. Remove the 4 x self tapping screws from the back cover then remove the back cover by pulling it away from the instrument



3. Remove the earth screw which passes through the underside of the case then slide out the board or boards



4. Configure the PCB links as requred, see appropriate chapter

5. Slide PCB back into case

6. Replace the earth screw which passes through the case

7. Refit the back cover and fix with the self tapping screws

8. Plug the terminal strips back into the rear of the instrument

4 Function table - for rate/frequency only display

The function table below shows the functions which will be seen when the **SEt OPEr** function is set to **FrEq**.

Note: the order in which the functions appear on the display may not be exactly as shown below. The availability and order of functions is determined by choice of function settings and options fitted.

Functions in this first table are available in **FUnC** or **CAL** mode

Display	Function	Range	Default	Your record	Ref/Page
A*x*Lo	Low setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 6.1	7.3 / 29
A*x*Hi	High setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 6.1	7.4 / 29
A*x*HY	Hysteresis value for the designated alarm relay *x*.	**0** to **9999**	**10**	See 6.1	7.5 / 30
A*x*tt	Trip time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 6.1	7.6 / 31
A*x*rt	Reset time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 6.1	7.7 / 31
A*x*n.o or **A*x*n.c**	Alarm relay *x* action to normally open (de-energised) or normally closed (energised)	**A*x*n.o** or **A*x*n.c**	**A*x*n.o**	See 6.1	7.8 / 31
A*x*SP or **A*x*t 1** etc.	Relay operation independent setpoint or trailing setpoint (*__Optional__)	**A*x*SP** or **A*x*t 1** etc.	**A*x*SP**	See 6.1	7.9 / 32
brgt	Display brightness level	**1** to **15**	**15**		7.10 / 32
dULL	Display remote brightness switching	**0** to **15**	**1**		7.11 / 32

(*__Optional__)—this function will only be accessible if the relevant option is fitted

Functions in this second table are available only in **CAL** mode or if **ACCS** is set to **ALL**

Display	Function	Range	Default	Your record	Ref/Page
bAr_	Bargraph low value (seen only on bargraph display instruments)	Any display value	**0**		7.13 / 33
bAr¯	Bargraph high value (seen only on bargraph display instruments)	Any display value	**1000**		7.14 / 33

(*__Optional__)—this function will only be accessible if the relevant option is fitted

bAr tYPE	Bargraph type for instruments with bargraph display (seen only on bargraph display instruments)	bAr, S.dot, d.dot, C.bAr or r.dot	bAr		7.15 / 34
d9OP	Digital output option mode (*Optional)	bcd, b.SCL, bi n or bi n2	bi n2		7.16 / 35
d9.OP	Digital output option polarity (*Optional)	AI o or AHi	AI o		7.17 / 35
bcd Strt	Digital output option BCD start position (*Optional)	0, 1 or 2	0		7.18 / 35
di 9_	Digital output option low value (*Optional)	Any display value	0		7.19 / 35
di 9¯	Digital output option high value (*Optional)	Any display value	1000		7.20 / 36
rEC_	Analog output option low display value (*Optional)	Any display value	0		7.21 / 36
rEC¯	Analog output option high display value (*Optional)	Any display value	1000		7.22 / 36
rEC_ Ch2	Second analog output option low display value (*Optional)	Any display value	0		7.23 / 37
rEC¯ Ch2	Second analog output option high display value (*Optional)	Any display value	1000		7.24 / 37
drnd	Display rounding	1 to 5000	1		7.25 / 37
FLtr	Digital filter	0 to 8	2		7.26 / 37
rEc ctrl	Analog output PI control (*Optional)	on or OFF	OFF		7.27 / 38
rAtE dCPt	Rate display decimal point selection	0 to number of display digits minus 1	0		7.28 / 38
rAtE inPt	Rate input scale factor	Any display value	1		7.29 / 38
rAtE SCLE	Rate scale factor	Any display value	1		7.30 / 38
PErd dCPt	Period display decimal point selection	0, 0.00.02 etc.	0		7.31 / 39
PErd inPt	Rate input scale factor	Any display value	1		7.32 / 39
PErd SCLE	Period scale factor	Any display value	1		7.33 / 39
FrEq rnGE	Frequency range	LoF. Hi F, AUtO or r.AUt	Hi F		7.39 / 42
FASt UPdt	Fast update	on or OFF	OFF		7.40 / 42

(*Optional)—this function will only be accessible if the relevant option is fitted

INPt EdGE	Input edge	rISE or FALL	rISE		7.47 / 45
diSP	Display rate or period	rAtE or PErd	rAtE		7.42 / 43
diSP rnGE	Period display range	0, 0.01, 0.02 or 0.00.02	0		7.43 / 43
tout SECS	Rate display time out	1 or 9999	1		7.44 / 44
AUGE SECS	Average display seconds	1 or 9999	1		7.45 / 44
AUGE cnt	Average display counts	1 or 30	1		7.46 / 44
INPt EdGE	Input edge	rISE or FALL	rISE		7.47 / 45
r.InP	Remote input function	nonE, P.HLd, d.HLd, HI, Lo, HI Lo, ZErO, SP.Ac, no.Ac, diSP, dULL or 9.rSt	nonE		7.48 / 45
P.but	P button function	nonE, HI, Lo, HI Lo, ZErO, diSP, FUnC or 9.rSt	nonE		7.49 / 46
ACCS	Access mode	OFF, EASY, nonE or ALL	OFF		7.50 / 46
SPAC	Setpoint access mode (*Optional)	A1, A1-2 etc.	A1		7.51 / 47
Lo diSP	Low overrange visual warning limit value	Any display value or OFF	OFF		7.57 / 48
HI 9H diSP	High overrange visual warning limit value	Any display value or OFF	OFF		7.58 / 49
diSP	Display visual warning flashing mode	FLSH or -or-	FLSH		7.59 / 49
SEt OPEr	Set display operation	S.Prd, PErd, FrEq, totL or both	FrEq		7.66 / 51

(*Optional)—this function will only be accessible if the relevant option is fitted

bAUd rAtE	Baud rate for serial communications (*Optional)	300.600. 1200.2400. 4800.9600. 19.2 or 38.4	9600		7.67 / 51
PrtY	Parity for serial communications (*Optional)	nonE.EUEn or odd	nonE		7.68 / 52
O.Put	Output for serial communications (*Optional)	dI SP.Cont. POLL, A.buS or ñ.buS	Cont		7.69 / 52
Addr	Instrument address for serial communications (*Optional)	0 to 31	0		7.70 / 52

(*Optional)—this function will only be accessible if the relevant option is fitted

4.1 Relay table

Record your relay settings in the table below

Display	Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7
A*x*Lo							
A*x*Hi							
A*x*HY							
A*x*tt							
A*x*rt							
A*x*n.o or A*x*n.c							
A*x*SP or A*x*t 1 etc.	n/a						
A*x*.rt, A*x*.tL or A*x*.PS							

5 Function table - for total only display

The function table below shows the functions which will be seen when the **SEt OPEr** function is set to **totL**.

Note: the order in which the functions appear on the display may not be exactly as shown below. The availability and order of functions is determined by choice of function settings and options fitted.

Functions in this first table are available in **FUNC** or **CAL** mode

Display	Function	Range	Default	Your record	Ref/Page
AxPS	Relay pass value	Any display value	**OFF**	See 6.1	7.1 / 28
AxPt	Relay pass time	**0.0** to **999.9**	**0.0**	See 6.1	7.2 / 28
AxLo	Low setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 6.1	7.3 / 29
AxHi	High setpoint value for designated alarm relay *x*	Any display value or **OFF**	**OFF**	See 6.1	7.4 / 29
AxHY	Hysteresis value for the designated alarm relay *x*.	**0** to **9999**	**10**	See 6.1	7.5 / 30
Axtt	Trip time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 6.1	7.6 / 31
Axrt	Reset time delay for the designated alarm relay *x*.	**0** to **9999**	**0**	See 6.1	7.7 / 31
Axn.o or **Axn.c**	Alarm relay *x* action to normally open (de-energised) or normally closed (energised)	**Axn.o** or **Axn.c**	**Axn.o**	See 6.1	7.8 / 31
AxSP or **Axt 1** etc.	Relay operation independent setpoint or trailing setpoint (*__Optional__)	**AxSP** or **Axt 1** etc.	**AxSP**	See 6.1	7.9 / 32
br9t	Display brightness level	**1** to **15**	**15**		7.10 / 32
dULL	Display remote brightness switching	**0** to **15**	**1**		7.11 / 32
P.SEt	Preset value	Any display value	**0**		7.12 / 33

(*__Optional__)—this function will only be accessible if the relevant option is fitted

Functions in this second table are available only in **CAL** mode or if **ACCS** is set to **ALL**.

Display	Function	Range	Default	Your record	Ref/Page

(*__Optional__)—this function will only be accessible if the relevant option is fitted

bAr_	Bargraph low value (seen only on bargraph display instruments)	Any display value	0		7.13 / 33
bAr¯	Bargraph high value (seen only on bargraph display instruments)	Any display value	1000		7.14 / 33
bAr tYPE	Bargraph type for instruments with bargraph display (seen only on bargraph display instruments)	bAr, S.dot, d.dot, C.bAr or r.dot	bAr		7.15 / 34
d9OP	Digital output option mode (*Optional)	bcd, b.SCL, bin or bin2	bin2		7.16 / 35
d9.OP	Digital output option polarity (*Optional)	AIo or AHi	AIo		7.17 / 35
bcd Strt	Digital output option BCD start position (*Optional)	0, 1 or 2	0		7.18 / 35
di 9_	Digital output option low value (*Optional)	Any display value	0		7.19 / 35
di 9¯	Digital output option high value (*Optional)	Any display value	1000		7.20 / 36
rEC_	Analog output option low display value (*Optional)	Any display value	0		7.21 / 36
rEC¯	Analog output option high display value (*Optional)	Any display value	1000		7.22 / 36
rEC_ Ch2	Second analog output option low display value (*Optional)	Any display value	0		7.23 / 37
rEC¯ Ch2	Second analog output option high display value (*Optional)	Any display value	1000		7.24 / 37
rEc ctrl	Analog output PI control (*Optional)	on or OFF	OFF		7.27 / 38
tOtl dCPt	Total display decimal point selection	0 to number of display digits minus 1	0		7.34 / 40
totl inPt	Total input	Any positive display value	1		7.35 / 40
totl SCLE	Total scale	Any display value	1		7.36 / 40
trnc	Truncation	on or OFF	OFF		7.37 / 40
9.tot	Grand Total	nonE. For, rEU, POS, nEG, Abs or rSt	nonE		7.38 / 41
inPt EdGE	Input edge	rISE or FALL	rISE		7.47 / 45

(*Optional)—this function will only be accessible if the relevant option is fitted

r.I nP	Remote input function	nonE, P.HLd, d.HLd, Hi , Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, di SP, duLL or 9.rSt	nonE		7.48 / 45
P.but	P button function	nonE, Hi , Lo, Hi Lo, 2Er0, di SP, FUnC or 9.rSt	nonE		7.49 / 46
ACCS	Access mode	OFF.EASY. nonE or ALL	OFF		7.50 / 46
SPAC	Setpoint access mode (*Optional)	A 1.A 1-2 etc.	A 1		7.51 / 47
Ax.rt, Ax.tL or Ax.PS	Alarm relay operation mode	Ax.rt, Ax.tL or Ax.PS	Ax.rt		7.52 / 47
Lo di SP	Low overrange visual warning limit value	Any display value or OFF	OFF		7.57 / 48
HI 9H di SP	High overrange visual warning limit value	Any display value or OFF	OFF		7.58 / 49
di SP	Display visual warning flashing mode	FLSH or -or-	FLSH		7.59 / 49
S.I nP	SET terminal input function	Lo or hi 9h	hi 9h		7.60 / 49
c.rSt	Totaliser counter reset value	2Er0 or PSEt	2Er0		7.61 / 50
c.rSt	Totaliser counter reset signal	Lo, LoE, Hi or Hi E	Lo		7.62 / 50
cntr rSt	Totaliser counter reset value	Any display value	0		7.63 / 50
A 1Hi rSt	Alarm 1 high reset	on or OFF	OFF		7.64 / 50
SEt OPEr	Set display operation	S.Prd, PErd, FrEq, totL or both	FrEq		7.66 / 51
bAUd rAtE	Baud rate for serial communications (*Optional)	300.600. 1200.2400. 4800.9600. 19.2 or 38.4	9600		7.67 / 51

(*Optional)—this function will only be accessible if the relevant option is fitted

PrtY	Parity for serial communications (*Optional)	nONE, EUEn or odd	nONE		7.68 / 52
O.Put	Output for serial communications (*Optional)	dISP, Cont, POLL, A.buS or ñ.buS	Cont		7.69 / 52
Addr	Instrument address for serial communications (*Optional)	0 to 31	0		7.70 / 52

(*Optional)—this function will only be accessible if the relevant option is fitted

5.1 Relay table

Record your relay settings in the table below

Display	Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7
A*x*PS							
A*x*Pt							
A*x*Lo							
A*x*H,							
A*x*HY							
A*x*tt							
A*x*rt							
A*x*n.o or A*x*n.c							
A*x*SP or A*x*t 1 etc.	n/a						
Ax.rt, Ax.tL or Ax.PS							

6 Function table - for both total and rate/frequecy display

The function table below shows the functions which will be seen when the **SEt OPEr** function is set to **both**. When **both** mode is used the functions available allow for both the ratemeter and totaliser scaling and setup. If front panel pushbuttons are fitted to the display type being used then the ▲ and ▼ buttons can be used to toggle between totaliser and ratemeter displays. Alternatively a remote input contact closure can be used across terminals 7 and 8 at the rear of the instrument. If these terminals are to be used to toggle between displays then the remote input function **r.I nP** must be set to **dI SP**. If fitted the front **P** button can also be used to toggle between display modes by setting the **P.but** function to **dI SP**.

Note: the order in which the functions appear on the display may not be exactly as shown below. The availability and order of functions is determined by choice of function settings and options fitted.

Functions in this first table are available in **FUNC** or **CAL** mode

Display	Function	Range	Default	Your record	Ref/Page
AxPS	Relay pass value	Any display value	**OFF**	See 6.1	7.1 / 28
AxPt	Relay pass time	**0.0** to **999.9**	**0.0**	See 6.1	7.2 / 28
AxLo	Low setpoint value for designated alarm relay x	Any display value or **OFF**	**OFF**	See 6.1	7.3 / 29
AxHi	High setpoint value for designated alarm relay x	Any display value or **OFF**	**OFF**	See 6.1	7.4 / 29
AxHY	Hysteresis value for the designated alarm relay x.	**0** to **9999**	**10**	See 6.1	7.5 / 30
Axtt	Trip time delay for the designated alarm relay x.	**0** to **9999**	**0**	See 6.1	7.6 / 31
Axrt	Reset time delay for the designated alarm relay x.	**0** to **9999**	**0**	See 6.1	7.7 / 31
Axn.o or **Axn.c**	Alarm relay x action to normally open (de-energised) or normally closed (energised)	**Axn.o** or **Axn.c**	**Axn.o**	See 6.1	7.8 / 31
AxSP or **Axt 1** etc.	Relay operation independent setpoint or trailing setpoint (*__Optional__)	**AxSP** or **Axt 1** etc.	**AxSP**	See 6.1	7.9 / 32
br9t	Display brightness level	**1** to **15**	**15**		7.10 / 32
duLL	Display remote brightness switching	**0** to **15**	**1**		7.11 / 32
P.SEt	Preset value	Any display value	**0**		7.12 / 33

(*__Optional__)—this function will only be accessible if the relevant option is fitted

Functions in this second table are available only in CAL mode or if ACCS is set to ALL

Display	Function	Range	Default	Your record	Ref/Page
brgt	Display brightness level	1 to 15	15		7.10 / 32
dull	Display remote brightness switching	0 to 15	1		7.11 / 32
bAr_	Bargraph low value (seen only on bargraph display instruments)	Any display value	0		7.13 / 33
bAr^	Bargraph high value (seen only on bargraph display instruments)	Any display value	1000		7.14 / 33
bAr tYPE	Bargraph type for instruments with bargraph display (seen only on bargraph display instruments)	bAr, S.dot, d.dot, C.bAr or r.dot	bAr		7.15 / 34
d9OP	Digital output option mode (*Optional)	bcd, b.SCL, bi n or bi n2	bi n2		7.16 / 35
d9.OP	Digital output option polarity (*Optional)	AI o or AHi	AI o		7.17 / 35
bcd Strt	Digital output option BCD start position (*Optional)	0, 1 or 2	0		7.18 / 35
di 9_	Digital output option low value (*Optional)	Any display value	0		7.19 / 35
di 9^	Digital output option high value (*Optional)	Any display value	1000		7.20 / 36
rEC_	Analog output option low display value (*Optional)	Any display value	0		7.21 / 36
rEC^	Analog output option high display value (*Optional)	Any display value	1000		7.22 / 36
rEC_ Ch2	Second analog output option low display value (*Optional)	Any display value	0		7.23 / 37
rEC^ Ch2	Second analog output option high display value (*Optional)	Any display value	1000		7.24 / 37
drnd	Display rounding	1 to 5000	1		7.25 / 37
FLtr	Digital filter	0 to 8	2		7.26 / 37
rEc ctrl	Analog output PI control (*Optional)	on or OFF	OFF		7.27 / 38
rAtE dCPt	Rate display decimal point selection	0 to number of display digits minus 1	0		7.28 / 38
rAtE inPt	Rate input scale factor	Any display value	1		7.29 / 38

(*Optional)—this function will only be accessible if the relevant option is fitted

rAtE SCLE	Rate scale factor	Any display value	1		7.30 / 38
PEr d dCPt	Period display decimal point selection	0, 0.00.02 etc.	0		7.31 / 39
PEr d I nPt	Rate input scale factor	Any display value	1		7.32 / 39
PEr d SCLE	Period scale factor	Any display value	1		7.33 / 39
tOtl dCPt	Total display decimal point selection	0 to number of display digits minus 1	0		7.34 / 40
totl I nPt	Total input	Any positive display value	1		7.35 / 40
totl SCLE	Total scale	Any display value	1		7.36 / 40
trnc	Truncation	on or OFF	OFF		7.37 / 40
9.tot	Grand Total	nONE. For, rEU, POS, nEG, Abs or rSt	nONE		7.38 / 41
FrEq rnGE	Frequency range	LoF. Hi F, AUGE or r.AUG	Hi F		7.39 / 42
FASt UPdt	Fast update	on or OFF	OFF		7.40 / 42
I nPt EdGE	Input edge	rI SE or FALL	rI SE		7.47 / 45
di SP	Display rate or period	rAtE or PEr d	rAtE		7.42 / 43
di SP rnGE	Period display range	0, 0.0 1, 0.02 or 0.00.02	0		7.43 / 43
tout SECS	Rate display time out	1 or 9999	1		7.44 / 44
AUGE SECS	Average display seconds	1 or 9999	1		7.45 / 44
AUGE cnt	Average display counts	1 or 30	1		7.46 / 44
I nPt EdGE	Input edge	rI SE or FALL	rI SE		7.47 / 45

(*__Optional__)—this function will only be accessible if the relevant option is fitted

r.I nP	Remote input function	nonE, P.HLd, d.HLd, Hi , Lo, Hi Lo, 2Er0, SP.Ac, no.Ac, dI SP, duLL or 9.rSt	nonE		7.48 / 45
P.but	P button function	nonE, Hi , Lo, Hi Lo, 2Er0, dI SP, FUnC or 9.rSt	nonE		7.49 / 46
ACCS	Access mode	OFF, EASY, nonE or ALL	OFF		7.50 / 46
SPAC	Setpoint access mode (*Optional)	A 1, A 1-2 etc.	A 1		7.51 / 47
Ax.rt, Ax.tL or Ax.PS	Alarm relay operation mode	Ax.rt, Ax.tL or Ax.PS	Ax.rt		7.52 / 47
rEC	Analog operation mode (*Optional)	rAtE or totL	rAtE		7.53 / 47
rEC2	Second analog operation mode (*Optional)	rAtE or totL	rAtE		7.54 / 48
bAr	Bargraph display operation mode	rAtE or totL	rAtE		7.55 / 48
dIGP	Digital output operation mode (*Optional)	rAtE or totL	rAtE		7.56 / 48
Lo dI SP	Low overrange visual warning limit value	Any display value or OFF	OFF		7.57 / 48
Hi IH dI SP	High overrange visual warning limit value	Any display value or OFF	OFF		7.58 / 49
dI SP	Display visual warning flashing mode	FLSH or -or-	FLSH		7.59 / 49
S.I nP	SET terminal input function	Lo or hi 9h	hi 9h		7.60 / 49
c.rSt	Totaliser counter reset value	2Er0 or PSEt	2Er0		7.61 / 50
c.rSt	Totaliser counter reset signal	Lo, LoE, Hi or Hi E	Lo		7.62 / 50
cntr rSt	Totaliser counter reset value	Any display value	0		7.63 / 50
A 1H, rSt	Alarm 1 high reset	on or OFF	OFF		7.64 / 50

(*Optional)—this function will only be accessible if the relevant option is fitted

dFlt dISP	Default display	rAtE, PErd or totl	rAtE		7.65 / 51
SEt OPEr	Set display operation	S.Prd, PErd, FrEq, totL or both	FrEq		7.66 / 51
bAUd rAtE	Baud rate for serial communications (*Optional)	300.600. 1200.2400. 4800.9600. 19.2 or 38.4	9600		7.67 / 51
PrtY	Parity for serial communications (*Optional)	nonE.EUEn or odd	nonE		7.68 / 52
O.Put	Output for serial communications (*Optional)	dISP.Cont. POLL, A.buS or ñ.buS	Cont		7.69 / 52
Addr	Instrument address for serial communications (*Optional)	0 to 31	0		7.70 / 52

(*Optional)—this function will only be accessible if the relevant option is fitted

6.1 Relay table

Record your relay settings in the table below

Display	Relay 1	Relay 2	Relay 3	Relay 4	Relay 5	Relay 6	Relay 7
Rxlo							
RxHi							
RxHY							
Rxtt							
Rxrt							
Rxn.o or Rxn.c							
RxSP or Rxt 1 etc.	n/a						
Rx.rt, Rx.tL or Rx.PS							

7 Explanation of functions

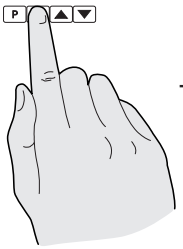
The PM4 setup and calibration functions are configured through a push button sequence. The three push buttons located at the rear of the instrument (also at the front on some display options) are used to alter settings. Two basic access modes are available:

FUNC mode (simple push button sequence) allows access to commonly set up functions such as alarm setpoints.

CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

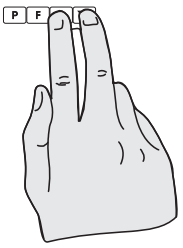
Once CAL or FUNC mode has been entered you can step through the functions, by pressing and releasing the F push button, until the required function is reached. Changes to functions are made by pressing the ▲ or ▼ push button (in some cases both simultaneously) when the required function is reached. See the flow chart example on the following page.

Entering CAL Mode



1. Remove power from the instrument. Hold in the F button and reapply power. The display will briefly indicate CAL as part of the "wake up messages" when the CAL message is seen you can release the button. Move to step 2 below.

2. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button. Move to step 3 below.



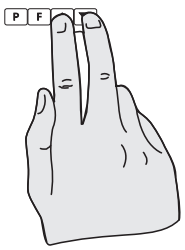
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

Note: If step 1 above has been completed then the instrument will remain in this CAL mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed.

Entering FUNC Mode

No special power up procedure is required to enter FUNC mode.

1. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button.



2. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

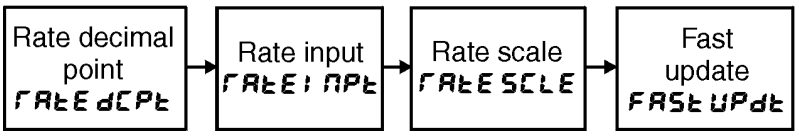
Frequency/rate mode operation modes

This mode is chosen by selecting FrEq at the oPEr function. The ratemeter mode can operate in one of 4 basic ways to give different display options namely:

1. Rate display, high frequency

If Hi F is selected at the FrEq rnGE function the instrument acts as a general purpose frequency/ratemeter/tachometer. If a very low frequency (below approx. 4Hz) input is used then LoF mode should be selected. At frequencies below 4Hz, if Hi F is selected, the display may alternate between an actual frequency reading and a zero reading, this is due to the higher sampling rate when Hi F is selected.

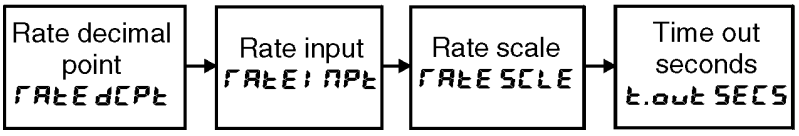
Functions specific to display with FrEq rnGE set to Hi F with a rate display



2. Rate display, low frequency

If LoF is selected at the FrEq rnGE function the instrument expects an input frequency of less than 1kHz. This mode allows very low frequency inputs without exhibiting the apparent display instability often seen with low frequency inputs. This is accomplished by allowing the user to set a "time out" value - see the tout SECS function.

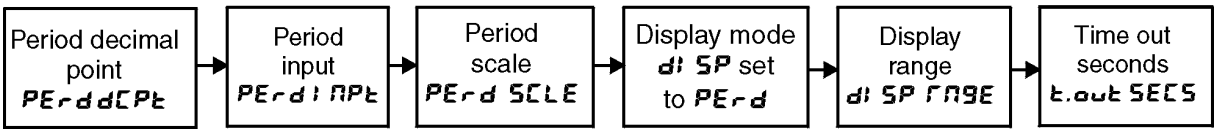
Functions specific to display with FrEq rnGE set to LoF with a rate display



3. Period display, low frequency

With LoF selected at the FrEq rnGE function the user has the option of either displaying the rate (rAtE or period (PErd) of the input (chosen via the di SP function). If PErd is selected then the display will show the period (or scaled period if required) of the input pulse rather than the rate.

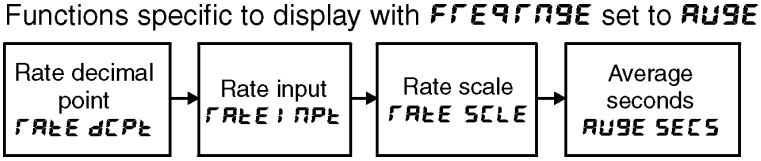
Functions specific to display with FrEq rnGE set to Lo F with a period display



4. Averaged rate display

With AUGE selected at the FrEq rnGE function the display will average the rate input over the number of seconds selected at the AUGE SECS function. The display will only update at the end of the averaging period. This mode allows the user to see a steady averaged display for an input which produces short term irregularities. Note a rolling average r.AUG range is also available - see "Examples" at the end of this chapter.

Functions specific to display with FrEq rnGE set to AUGE with an averaged rate display



Easy alarm relay adjustment access facility

The display has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the F button at the front or rear of the instrument. The first setpoint will then appear and changes to this setpoint may be made to this setpoint via the ▲ or ▼ buttons. Press the F button to accept any changes or to move on to the next setpoint. Note: this easy access also functions in the same manner for the PI control setpoint (relay and/or analog PI output) if PI control is available. The instrument must be set in the manner described below to allow the easy access facility to work:

1. The **r.I nP** function must be set to **SPAC** or the **ACCS** function must be set to **EASY**.
2. At least one alarm must have a setpoint, nothing will happen if all the alarm setpoints are set to **OFF**.
3. The **SPAC** function must be set to allow access to the relays required e.g. if set to **A 1-2** then the easy access will work only with alarm relays 1 and 2 even if more relays are fitted.
4. The instrument must be in normal measure mode i.e. if the instrument is powered up so that it is in **CAL** mode then the easy access will not function. If in doubt remove power from the instrument, wait for a few seconds then apply power again.
5. If the easy access facility is used then the only way to view or alter any other function settings is to power up via **CAL** mode i.e. there is no entry to **FUNC** mode functions unless the instrument is powered up in **CAL** mode.

Explanation of Functions

7.1 Relay pass value

Display:	**AxPS**
Range:	Any display value
Default Value:	**OFF**

Alarm relay pass value - only seen when **AxPS** is selected at the **Axrt/AxtL/AxPS** function. Displays and sets the chosen alarm relay (**A 1Pt**, **A2Pt** etc.) pass time in seconds. The alarm relay will activate at multiples of the pass value e.g. if **A 1PS** is set to **50** then relay 1 will activate at a total display value of **50**, **100**, **150** etc. The time for which the relay remains activated at each pass value is set via the **AxPt** function which follows. The pass value may be set anywhere in the display range of the instrument, positive or negative. The pass value can be set to **OFF** (disabled) by pressing the ▲ and ▼ buttons together.

7.2 Relay pass time

Display:	**AxPt**
Range:	**0.0** to **999.9**
Default Value:	**0.0**

Alarm relay pass time - only seen when **AxPS** selected at the **Axrt/AxtL/AxPS** function. Displays and sets the chosen alarm relay (**A 1Pt**, **A2Pt** etc.) pass time in seconds. The value set is the time for which the relay will remain energised when activated at a pass value. e.g. if set to

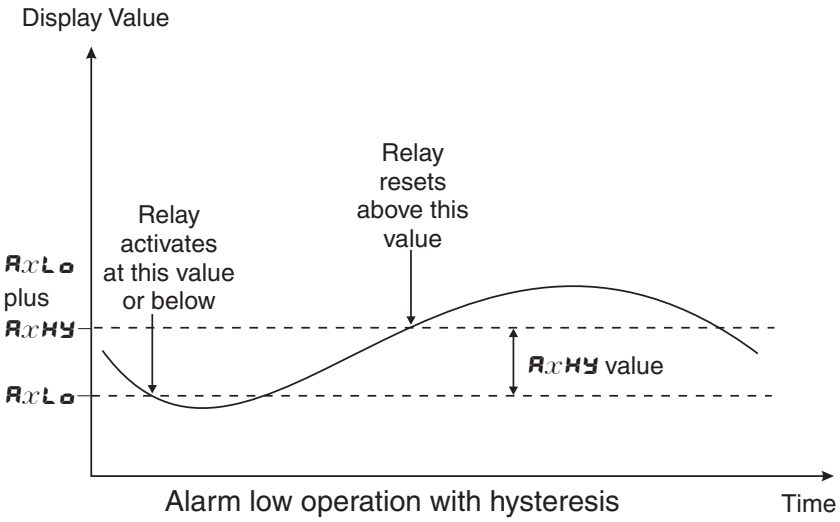
2.0 with a **A 1PS** value of **50** then the relay will remain energised for **2.0** seconds every time the display passes a multiple of **50**. Note: If the pass time exceeds the time taken to reach consecutive pass values then the instrument will "store" any relay operations it does not have time to activate and will perform these activations when the total display update rate allows. For this reason the relay may be seen to activate repeatedly for a period after the total update rate has slowed down or stopped.

7.3 Alarm relay low setpoint

Display: **A*x*Lo**
Range: Any display value or **OFF**
Default Value: **OFF**

Displays and sets the low setpoint value for the designated alarm relay x. Note x will be replaced by the relay number when displayed e.g. **A 1Lo** for relay 1. Use this low setpoint function if a relay operation is required when the display value becomes equal to or less than the low setpoint value. To set a low alarm value go to the **A*x*Lo** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value. The low alarm setpoint may be disabled by pressing the ▲ and ▼ push buttons simultaneously. When the alarm is disabled the display will indicate **OFF**. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the **A*x*HY** function.

Example:
If **A 1Lo** is set to **10** then relay 1 will activate when the display value is 10 or less.



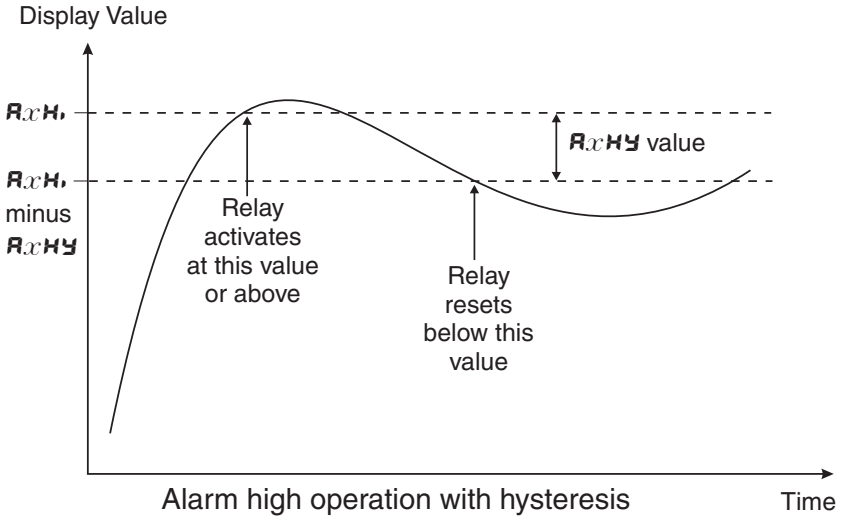
7.4 Alarm relay high setpoint

Display: **A*x*H**
Range: Any display value or **OFF**
Default Value: **OFF**

Displays and sets the high setpoint value for the designated alarm relay x. Note x will be replaced by the relay number when displayed e.g. **A 1H** for relay 1. Use this high setpoint function if a relay operation is required when the display value becomes equal to or more than the low setpoint

value. To set a high alarm value go to the **RxH,** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value. The high alarm setpoint may be disabled by pressing the ▲ and ▼ push buttons simultaneously. When the alarm is disabled the display will indicate **OFF**. If the relay is allocated both a low and high setpoint then the relay will activate when the value displayed moves outside the band set by the low and high setpoints. The value at which the relay will reset is controlled by the **RxHY** function.

Example:
If **R 1H,** is set to **100** then relay 1 will activate when the display value is **100** or higher.



7.5 Alarm relay hysteresis (deadband)

Display: **RxHY**
Range: **0** to **9999**
Default Value: **10**

Displays and sets the alarm relay hysteresis limit for the designated relay x. Note x will be replaced by the relay number when displayed e.g. **R 1HY** for relay 1. To set a relay hysteresis value go to the **RxHY** function and use the ▲ or ▼ push buttons to set the value required then press **F** to accept this value. The hysteresis value is common to both high and low setpoint values. The hysteresis value may be used to prevent too frequent operation of the relay when the measured value is rising and falling around setpoint value. e.g. if **R 1HY** is set to zero the alarm will activate when the display value reaches the alarm setpoint (for high alarm) and will reset when the display value falls below the setpoint, this can result in repeated on/off switching of the relay at around the setpoint value.

The hysteresis setting operates as follows: In the high alarm mode, once the alarm is activated the input must fall below the setpoint value minus the hysteresis value to reset the alarm. e.g. if **R 1H,** is set to **50.0** and **R 1HY** is set to **3.0** then the setpoint output relay will activate once the display value goes to **50.0** or above and will reset when the display value goes below **47.0** i.e. at **46.9** or below. In the low alarm mode, once the alarm is activated the input must rise above the setpoint value plus the hysteresis value to reset the alarm. e.g. if **R 1Lo** is to **20.0** and **R 1HY** is set to **10.0** then the alarm output relay will activate when the display value falls to **20.0** or below and will reset when the display value goes above **30.0** i.e at **30.1** or above. The hysteresis units are expressed in displayed engineering units.

Example: If **R 1H,** is set to **100** and **R 1HY** is set to **10** then relay 1 will activate when the display value is **100** or higher and will reset at a display value of **89** or lower.

7.6 Alarm relay trip time

Display: Axtt
Range: 0 to 9999
Default Value: 0

Displays and sets the alarm trip time in seconds. The trip time is common for both alarm high and low setpoint values. The trip time provides a time delay before the alarm relay will activate when an alarm condition is present. The alarm condition must be present continuously for the whole trip time period before the alarm will activate. If the input moves out of alarm condition during this period the timer will reset and the full time delay will be restored. This trip time delay is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over 0 to 9999 seconds. To set a trip time value go to the Axtt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: If A 1tt is set to 5 seconds then the display must indicate an alarm value for a full 5 seconds before relay 1 will activate.

7.7 Alarm relay reset time

Display: Axrt
Range: 0 to 9999
Default Value: 0

Displays and sets the alarm reset delay time in seconds. The reset time is common for both alarm high and low setpoint values. With the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. If the input moves back into alarm condition during this period the timer will reset and the full time delay will be restored. The reset time is selectable over 0 to 9999 seconds. To set a reset time value go to the Axrt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: If A 1rt is set to 10 seconds then the resetting of alarm relay 1 will be delayed by 10 seconds.

7.8 Alarm relay normally open/closed

Display: Axn.o or Axn.c
Range: Axn.o or Axn.c
Default Value: Axn.o

Displays and sets the setpoint alarm relay x action to normally open (de-energised) or normally closed (energised), when no alarm condition is present. Since the relay will always open when power is removed a normally closed alarm is often used to provide a power failure alarm indication. To set the alarm relay for normally open or closed go to the Axn.o or Axn.c function and use the ▲ or ▼ push buttons to set the required operation then press F to accept this selection. **Example:** If set to A 1n.o alarm relay 1 will be open circuit when the display is outside alarm condition and will be closed (short circuit across terminals) when the display is in alarm condition.

7.9 Alarm relay setpoint or trailing operation

Display: AxSP or Axt 1 etc.
Range: AxSP or Axt 1 etc.
Default Value: AxSP

Relay operation independent setpoint or trailing setpoint, this function only be seen where more than one relay is fitted. Each alarm relay, except relay 1, may be programmed to operate with an independent setpoint value or may be linked to operate at a fixed difference to another relay setpoint, known as trailing operation. The operation is as follows:

Alarm 1 (A1) is always independent. Alarm 2 (A2) may be independent or may be linked to Alarm 1. Alarm 3 (A3) may be independent or may be linked to Alarm 1 or Alarm 2. Alarm 4 (A4) may be independent or may be linked to Alarm 1, Alarm 2 or Alarm 3. The operation of each alarm is selectable by selecting, for example, (Alarm 4) A4.SP = Alarm 4 normal setpoint or A4.t 1 = Alarm 4 trailing Alarm 1 or A4.t2 = Alarm 4 trailing Alarm 2 or A4.t3 = Alarm 4 trailing Alarm 3. For trailing set points the setpoint value is entered as the difference from the setpoint being trailed. If the trailing setpoint is to operate ahead of the prime setpoint then the value is entered as a positive number and if operating behind the prime setpoint then the value is entered as a negative number.

Example: With Alarm 2 set to trail alarm 1, if A1H, is set to 1000 and A2H, is set to 50 then Alarm 1 will activate at 1000 and alarm 2 will activate at 1050 (i.e. 1000 + 50). If Alarm 2 had been set at -50 then alarm 2 would activate at 950 (i.e. 1000 – 50).

7.10 Display brightness

Display: brgt
Range: 1 to 15
Default Value: 15

Displays and sets the digital display brightness. The display brightness is selectable from 1 to 15, where 1 = lowest intensity and 15 = highest intensity. This function is useful for improving the display readability in dark areas or to reduce the power consumption of the instrument. See also the dull function. To set brightness level go to the brgt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

7.11 Display remote brightness switching

Display: dull
Range: 0 to 15
Default Value: 1

Displays and sets the level for remote input brightness switching, see r.1 nP function. When a remote input is set to dull the remote input can be used to switch between the display brightness level set by the brgt function 7.10 and the display brightness set by the dull function. The display dull level is selectable from 0 to 15, where 0 = lowest intensity and 15 = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels. To set dull level go to the dull function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

Example: With dULL set to 4 and brGt set to 15 and the r.I nP function set to dULL the display brightness will change from the 15 level to 4 when a switch connected to the remote input terminals is activated.

7.12 Preset value

Display: P.SEt
Range: Any display value
Default Value: 0

A preset value can be entered at this function, for totaliser operation only. If a remote input (r.I nP function) is programmed to PSEt then operation of the remote input will cause the display to change to the preset value. Any change in input from this point will cause a variation above or below the preset value. To set preset value go to the P.SEt function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

The display can also be set to default to the preset value when a reset input is applied. This selection is made at the c.rSt function.

The P.but function can be used to change the preset value if this function is set to FUnC. This will only normally be used where the preset value is required to be changed regularly.

Example:
With a display showing a value of 50 at a given input if the P.SEt function is set to 70 and the remote function is set to P.SEt then once the remote input is activated the same input will now have a display value of 70.

7.13 Bargraph low value

Display: bAr_
Range: Any display value
Default Value: 0

Seen only in bargraph display instruments. Displays and sets the bar graph low value i.e. the value on the 7 segment display at which the bargraph will start to rise. This may be independently set anywhere within the display range of the instrument. Note: The bAr_ and bAr¯ settings are referenced from the 7 segment display readings, not the bargraph scale values. The bargraph scale may scaled differently to the 7 segment display. For example the bargraph scale may be indicating percentage fill of a tank whilst the 7 segment display is indicating actual process units. To set bargraph low level go to the bAr_ function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

7.14 Bargraph high value

Display: bAr¯
Range: Any display value
Default Value: 1000

Seen only in bargraph display instruments. Displays and sets the bar graph high value i.e. the value on the 7 segment display at which the bargraph will reach its maximum indication (e.g. all LEDs

illuminated). May be independently set anywhere within the display range of the instrument. To set bargraph high level go to the bAr ˉ function and use the ▲ or ▼ push buttons to set the value required then press F to accept this value.

7.15 Bargraph type for instruments with bargraph display

Display: bAr tYPE

Range: bAr, S.dot, d.dot, C.bAr or r.dot

Default Value: bAr

Bar graph display operation mode - seen only in vertical or circular bargraph display instruments. Allows selection of bargraph operation mode. Choices available are:

- bAr - conventional solid bargraph display i.e. all LEDs illuminated when at full scale. When scaling the display use the bAr _ and bAr ˉ functions e.g. bAr _ = 0 and bAr ˉ = 100 will give a bargraph with no segments lit at a 7 segment display reading of 0 and all segments lit with a 7 segment display reading of 100.

- S.dot - single dot display. A single segment will be lit to indicate the input readings position on the scale. When scaling the display use the bAr _ and bAr ˉ functions e.g. bAr _ = 0 and bAr ˉ = 100 will give a bargraph with the bottom segment lit at a 7 segment display reading of 0 and the top segment lit with a 7 segment display reading of 100. Note: this could also be set up as a centre zero single dot display by entering a negative value and positive value. e.g. bAr _ = - 100, bAr ˉ = 100.

- d.dot - double dot display. Two segments will be lit to indicate the input reading position on the scale. The reading should be taken from the middle of the two segments. When scaling the display use the bAr _ and bAr ˉ functions e.g. bAr _ = 0 and bAr ˉ = 100 will give a bargraph with the bottom two segments lit at a 7 segment display reading of 0 and the top two segments lit with a 7 segment display reading of 100. Note: this could also be set up as a centre zero double dot display by entering a negative value and positive value. e.g. bAr _ = - 100, bAr ˉ = 100.

- C.bAr - centre bar display. The display will be a solid bargraph but will have its zero point in the middle of the display. If the seven segment display value is positive the bargraph will rise. If the seven segment display value is negative then the bargraph will fall. When scaling the display use the bAr _ and bAr ˉ functions e.g. bAr _ = 0 and bAr ˉ = 100 will give a bargraph with all the bottom half segments lit at a 7 segment display reading of - 100 and all the top segments lit with a 7 segment display reading of 100.

- r.dot - modulus or wrap around single dot bargraph. This mode of operation allows the bargraph to wrap around the limits set by the bAr _ and bAr ˉ functions by dividing the 7 segment display by the modulus (the modulus is the difference between 0 and bAr ˉ) and displaying the remainder. For example if bAr _ is set to 0 and bAr ˉ is set to 10 then in other bargaph modes when the 7 segment display reads a value such as 25 the bargraph would be stuck at the high limit of its travel since it cannot go beyond 10. In r.dot mode the display will wrap around at 10 then continue up the bar again and will be at the midpoint of the bargraph when the 7 segment display shows 25 (as it would for a 7 segment display of 15, 35, etc.). In this example for a 7 segment display of 25 the value of 25 is divided by the modulus value of 10 in this example and the remainder displayed i.e. 10 goes into 25 twice with the remainder of 5 and so a bargaph position of 5 is displayed. This mode will operate on both vertical and circular bargraph type displays.

7.16 Digital output option mode

Display: d90P
Range: bcd, b.SCL, bin or bin2
Default Value: bin2

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Selections available are: bin2 (signed binary) i.e. -32767 to 32767, bin (unsigned binary) i.e. 0 to 65535, b.SCL (scaled binary, see d9_ and d9- below), bcd (binary coded decimal) i.e. up to four BCD numbers. .

7.17 Digital output option polarity

Display: d9.0P
Range: AIo or AHi
Default Value: AIo

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Selections available are: AIo (active low i.e. logic 1 = 0V output, logic 0 = +V output) or AHi (active high i.e. logic 1 = +V output, logic 0 = 0V output).

7.18 Digital output option BCD start position

Display: bcd Strt
Range: 0, 1 or 2
Default Value: 0

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. This function affects BCD mode only and determines the number of digits to skip when outputting from the display. As the output is 16 bit it can output up to 4 BCD numbers. Select from 0 to number of display digits minus 4. e.g. for a 6 digit display you may select 0 to 2, if 2 is selected then the four left most digits will be output, if set to 0 then the four right most digits will be output.

7.19 Digital output option low value

Display: d9_
Range: Any display value
Default Value: 0

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Accepts any valid display value. Determines the low scaling point for the b.SCL mode and has no effect on other modes. See example which follows in 7.20.

7.20 Digital output option high value

Display: d. 9^

Range: Any display value

Default Value: 1000

Seen only with the 16 bit digital output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted. Determines the high scaling point for the b.SCL mode and has no effect on other modes.

Example: If d. 9_ is set to 0 and d. 9^ is set to 65535 ($2^{16} - 1$) then the retransmission will not be scaled i.e. a display of 2 will cause a retransmission of 2. If d. 9^ is now changed to 32767 ($2^{15} - 1$) then a display of 2 will cause a retransmission of 4 (note: rounding may occur on retransmission).

7.21 Analog output option low value

Display: rEC_

Range: Any display value

Default Value: 0

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted for wiring details and link settings. Displays and sets the analog retransmission (4–20mA, 0–1V or 0–10V, link selectable) output low value (4mA or 0V) in displayed engineering units. To set the analog output low value go to the rEC_ function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example: If it is required to retransmit 4mA when the display indicates 0 then select 0 in this function using the ▲ or ▼ button.

7.22 Analog output option high value

Display: rEC^

Range: Any display value

Default Value: 1000

Seen only when analog retransmission option fitted. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when this option is fitted for wiring details and link settings. Displays and sets the analog retransmission (4–20mA, 0–1V or 0–10V, link selectable) output high display value (20mA, 1V or 10V) in displayed engineering units. To set the analog output high value go to the rEC^ function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example: If it is required to retransmit 20mA when the display indicates 50 then select 50 in this function using the ▲ or ▼ button.

7.23 Second analog output option low value

Display: rEC_ Ch2
Range: Any display value
Default Value: 0

See rEC_ function 7.21 for description of operation.

7.24 Second analog output option high value

Display: rEC¯ Ch2
Range: Any display value
Default Value: 1000

See rEC¯ function 7.22 for description of operation.

7.25 Display rounding

Display: drnd
Range: 1 to 5000
Default Value: 1

Displays and sets the display rounding value for the rate/frequency display only. This value may be set to 1 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy in applications where it is undesirable to display to a fine tolerance. To set the display rounding value go to the drnd function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

Example:
If set to 10 the rate/frequency display values will change in multiples of 10 only i.e. display moves from 10 to 20 to 30 etc.

7.26 Digital filter

Display: FLtr
Range: 0 to 8
Default Value: 2

Displays and sets the digital filter value. Digital filtering uses a weighted average method of determining the display value and is used for reducing display value variation due to short term interference. The digital filter range is selectable from 0 to 8, where 0 = none and 8 = most filtering. Use ▲ or ▼ at the FLtr function to alter the filter level if required. Note that the higher the filter setting the longer the display may take to reach its final value when the input is changed, similarly the relay operation and any output options will be slowed down when the filter setting is increased. To set the digital filter value go to the FLtr function and use the ▲ or ▼ push buttons to set the required value then press F to accept this selection.

7.27 Analog output PI control

Display: rEc ctrl
Range: on or OFF
Default Value: OFF

Analog output mode - seen only when analog output option is fitted. This function allows selection of on or OFF for PI control analog output. If set to OFF the analog output operates as a retransmission output and uses the functions described in this chapter. If set to on the analog output operates as a PI control output.

When this function is set to on the following associated functions will appear: C.SEt, C.SPn, C_P9 , C_Po , C.I 9, CI L.H, CI L.L and rEC SPAC. These functions are not detailed in this manual. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet for description of the analog PI control functions and wiring details.

7.28 Rate display decimal point selection

Display: rAtE dCPt
Range: 0 to number of display digits minus 1
Default Value: 0

Rate decimal point selection - only seen when FrE9 or both mode selected. Displays and sets the decimal point position for the rate display. For example selecting 0 will mean no decimal points (e.g. a display such as 25), 0.1 means 1 decimal point place (e.g. 2.4), 0.02 gives 2 decimal point places (e.g. 2.35) etc. The maximum number of decimal point places is one less than the number of digits on the display e.g. a 4 digit display can have 3 decimal points, a 6 digit display can have 5 decimal points etc. Note: If the number of decimal points is altered then the display scaling figure (rAtE SCLE) will also be affected. Always check the scaling figure following a decimal point change and alter as required.

7.29 Rate input scale factor

Display: rAtE I nPt
Range: Any display value
Default Value: 1

Rate input scale factor - only seen when FrE9 or both mode selected. Displays and sets the number of input pulses to be used with the rate scale function to generate the display scaling. See examples later in this chapter and formula below.

7.30 Rate scale factor

Display: rAtE SCLE
Range: Any display value
Default Value: 1

Rate scale factor - only seen when FrE9 or both mode selected. Displays and sets the scale factor to be used with the rate input setting. See examples later in this chapter. Scale and input

work together as follows:

$$\text{Display} = \frac{\text{Input frequency (Hz)} \times \texttt{rAtE SCLE}}{\texttt{rAtE I nPt}}$$

Note: if either the rate input or rate scale factor are set to 0 the scaling will be 1:1 i.e. a 1Hz input will give a display of 1 i.e. it is assumed that there are no scaling factors.
Example: If an encoder sensing revolutions of a shaft puts out 20 pulses per revolution a **rAtE I nPt** of 20 and a **rAtE SCLE** of 60 will give a display in RPM. Note as the display value is calculated from the ratio between **rAtE I nPt** and **rAtE SCLE** settings of **rAtE I nPt** = 1 and **rAtE SCLE** = 3 will give the same result.

7.31 Period display decimal point selection

Display: **PEr d dCPt**
Range: **0**, **0.00.02** etc.
Default Value: **0**

Period decimal point selection - only seen when **di SP** function is set to **PErd**. Displays and sets the decimal point for the period display. Note that the decimal point display is tied to the display range (**di SP rnGE**) function e.g. if the display range function is set to **0.00.02** then the two decimal place setting will show up as **0.00.02** and one decimal place will show as **0.00. 1**.

7.32 Period input scale factor

Display: **PErd I nPt**
Range: Any display value
Default Value: **1**

Period input scale factor - only seen when **di SP** function is set to **PErd**. Displays and sets the number of time period to be used with the period scale function to generate the display scaling. See examples later in this chapter and formula below.

7.33 Period scale factor

Display: **PErd SCLE**
Range: Any display value
Default Value: **1**

Period scale factor - only seen when **di SP** function is set to **PErd**. Displays and sets the scale factor to be used with the period input setting. To calculate the display value the input frequency and hence the period of this input needs to be known. Scale and input work together to produce a display as follows:

$$\text{Display} = \frac{\text{Input period (seconds)} \times \texttt{PErdSCLE}}{\texttt{PErd I nPt}}$$

Note: the displayed value is also affected by the decimal point and display range settings.

7.34 Total display decimal point selection

Display: tOtl dCPt
Range: 0 to number of display digits minus 1
Default Value: 0

Total decimal point selection - Displays and sets the decimal point position for the total display. For example selecting 0 will mean no decimal points (e.g. a display such as 25), 0.1 means 1 decimal point place (e.g. 2.4), 0.02 gives 2 decimal point places (e.g. 2.35) etc. The maximum number of decimal point places is one less than the number of digits on the display e.g. a 4 digit display can have 3 decimal points, a 6 digit display can have 5 decimal points etc. Note: If the number of decimal points is altered then the calculated total display be affected. Always check the scaling values following a decimal point change and alter as required.

7.35 Total input scaling factor

Display: totl InPt
Range: Any positive display value
Default Value: 1

Displays and sets the number of input pulses to be used with the totl SCLE function to generate the required display scaling, see totl SCLE below.

7.36 Total scaling factor

Display: totl SCLE
Range: Any display value
Default Value: 1

Displays and sets the scaling factor to be used with the totl InPt function to generate the required display scaling. The total scale factor can be set to any display value and the decimal point value seen at this function will be set by the totl dCPt function. The display value is calculated in the following manner:

$$\text{New total} = \frac{\text{Input pulses counted} \times \texttt{totl SCLE}}{\texttt{totl InPt}}$$

Example: To scale the display to count total kilolitres with 2 decimal place from an input which gives 10 pulses per litre (i.e. 10,000 pulses per kilolitre) set totl dCPt to 0.02, set totl InPt to 10000 and set the totl SCLE to 1.00 (i.e. display will increment by 0.01 kilolitres for every 100 input pulses and by 1.00 kilolitres for every 10000 input pulses).

7.37 Truncation

Display: trnc
Range: on or OFF
Default Value: OFF

Totaliser truncation - only seen when totL or both mode selected. When set to OFF the

display will round up to the nearest total value. When set to on the display will not round up. For example with totl inpt set to 10 and totl scle set to 1 (i.e. 10 pulses for 1 count) and with the display just reset to zero if truncation is OFF then after 6 input pulses the display will round up to show 1. With truncation set to on the display will not show 1 until the full 10 input pulses have been received.

7.38 Grand total

Display: g.tot
Range: none. For, rEU, POS, nEg, Abs or rSt
Default Value: none

Grand total operating mode - By using the ▲ or ▼ pushbutton the display may be toggled between a total or a grand total display (or between rate, total and grand total in both mode). The display will briefly show either rAtE, totl or gtot to indicate what the following total display is showing. To reset the grand total the remote input must be set to grSt, see the rI nP function. Six modes of grand total display are provided namely:

none - no grand total display
For - Forward
rEU - Reverse
POS - Positive
nEg - Negative
Abs - Absolute
rSt - Reset

Mode	Up Count	Down Count
none	No effect	No effect
For	The grand total will increase with each up count input pulse. The grand total can show positive and negative totals.	The grand total will decrease with each down count input pulse. The grand total can show positive and negative totals.
rEU	The grand total will decrease with each up count input pulse. The grand total can show both positive and negative totals.	The grand total will increase with each down count input pulse. The grand total can show both positive and negative totals.
POS	The grand total will increase with each up count input pulse. The grand total display cannot go negative.	The grand total will not register any down count inputs i.e. the grand total will not change when down count only inputs are present. The grand total display cannot go negative.
nEg	The grand total will not register any up count inputs i.e. the grand total will not change when up count only inputs are present. The grand total display cannot go negative.	The grand total will increase with each down count input pulse. The grand total display cannot go negative.
Abs	The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.	The grand total will increase with any input pulse whether up or down count. The grand total display cannot go negative.
rSt	Grand total increments by 1 display unit each time total is reset or zeroed e.g. increments by 1 or 0.1 or 0.01 etc. irrespective of up or down count direction.	

These modes allow a choice of how the grand total will be displayed. The total may be switched between up and down count via the "SET" input and the **SI nP** function. Ensure that the "SET" link is in before attempting to use this input to change count direction. The following table illustrates each mode of operation.

7.39 Frequency range

Display: **FrEq rnGE**
Range: **LoF**. **Hi F**, **AUGE** or **r.AUG**
Default Value: **Hi F**

Frequency range - Displays and sets the frequency input range.

Select **LoF** if the input frequency is likely to be lower than 4Hz and not greater than 1kHz.

Select **HI F** for frequencies with a minimum input frequency of 3Hz or higher (maximum input frequency is 100kHz).

Note that the period display (in **both** or **FrEq** modes) will only be accessible when the frequency range is set to **LoF** and hence the input frequency must not be above 1kHz.

Select **AUGE** for an averaged display. The averaged display allows the input rate to be averaged over a period of seconds set by the **AUGE SECS** function. An averaged display is particularly useful when the input is irregular. By averaging the pulses over a period of time the display will give a more stable reading for these irregular pulses.

Select **r.AUG** for a "rolling averaged" display (note the filter **FLtr** function is not available when this mode is selected). The rolling average allows the frequency/rate reading to be averaged over a period set by the **AUGE SECS** function but this average is taken over a programmable number of counts set at the **AUGE Cnt** function. For example if the with the **FrEq rnGE** function set to **r.AUG** (rolling average), the **AUGE SECS** function set to **300** (300 seconds or 5 minutes) and the **AUGE Cnt** (average count) function set to 12 the display will be averaged and updated every 5 minutes with each new update showing not the average of the last 5 minutes but the average of the last 12 x 5 minute (1 hour) time periods.

For this example starting with a zero display a steady input scaled to read 1200 per hour would read 100 after the first 5 minutes, 200 after the second 5 minutes etc. up to 1200 after 1 hour (12 x 5 minutes). Beyond this time the display will update every 5 minutes showing the average over the last 12 x 5 minute time periods. The rate will be zeroed when the display is switched off of if the input stops for a sufficient time to allow the rate to fall to zero.

7.40 Fast update

Display: **FASt UPdt**
Range: **on** or **OFF**
Default Value: **OFF**

Seen only when **SEt OPEr** is set to **FrEq** and **FrEq rnGE** set to **Hi F**. With **FASt UPdt** set to **OFF** the relay updates will take place approximately twice per second. With **FASt UPdt** set to on the relay updates will take place approximately six times per second.

7.41 Input edge

Display: INPt EdGE
Range: rISE or FALL
Default Value: rISE

Displays and sets the pulse input edge on which triggering will occur. If set to rISE then the rising edge of the input pulse will trigger the input. If set to FALL then the falling edge of the input pulse will trigger the input. This function can be useful if one of the edges provides a better switching input than the other e.g. if there is a long rise time in the pulse input but a sharp fall time then select FALL as this will give a more definite pulse transition.

7.42 Display rate or period

Display: diSP
Range: rAtE or PEri
Default Value: rAtE

Period or rate display - This function is only seen when the FrEq rnGE function is set to LoF. When using the LoF range the user has the option of displaying either the rate of the input or the period of the input. Select rAtE for a rate display in Hz. Select PEri for a period display (display format is determined by the display range function (diSP rnGE) and the decimal point setting).

7.43 Period display range

Display: diSP rnGE
Range: 0, 0.01, 0.02 or 0.00.02
Default Value: 0

Period display range - Sets the display range when PEri is chosen as the default display at the diSP function (FrEq rnGE must also be set to LoF to see this function). Note: on electromagnetic display types the decimal point position must be mechanically fixed.

The 0 option allows a display in seconds. The 0.01 option allows a display in minutes and seconds and the 0.00.02 option allows a display in hours.mins.secs (5 and 6 digit displays only). The 0.02 option is available only on 4 digit displays.

The display units and scaling will now depend on the PEri dCPt, PEri INPt and PEri SCLE settings e.g. the display can be scaled to give a reading which is ten times the real period if required.

Examples below show how a 2Hz input (0.5 sec or 500mS period) is affected by the diSP rnGE, PEri dCPt and PEri SCLE functions. Examples are shown for a 6 digit display type instrument.

dI SP rnGE	PErd dCPt	PErd I nPt	PErd SCLE	Value displayed
0	0	1	1	500
0	0	1	2	1000
0	0	1	10	5000
0	0.003	1	0.00.01	0.500
0.01	0.00	1	1.00	500.0
0.00.02	0.00.02	1	0.00.01	0.05.00
0.00.02	0.00.02	1	0.0 1.00	0.50.00

With the PErd I nPt function set to 1000 the display will time in seconds rather than milli seconds. The display can now be made to show hours minutes and seconds. The table below gives some examples.

dI SP rnGE	PErd dCPt	PErd I nPt	PErd SCLE	Actual Period	Value displayed
0.00.02	0.00.02	1000	0.00.01	1m 15sec	0.01.15
0.00.02	0.00.02	1000	0.00.01	2h 12m 30sec	2.12.30

7.44 Rate display time out

Display: toUt SECS
Range: 1 or 9999
Default Value: 1

Only seen if LoF is selected under the FrEqrnGE function. Displays and sets the time out in seconds when using the low frequency (LoF) range. The timeout allows very low frequency inputs to be used without the display reverting to zero between samples. If no input pulses are received the display holds the previous display value for the time out period. If a pulse is received during this time the display will update. If no pulses are received or the input period exceeds the time out value set then the display will indicate 0 if displaying rate or -or- if displaying period.

7.45 Average display seconds

Display: AUGE SECS
Range: 1 or 9999
Default Value: 1

Only seen if AUGE or r.AUG is selected under the FrEqrnGE function. Displays and sets the number of seconds over which the rate should be averaged when using the low frequency (LoF) range. The rate display will not update until the end of the average seconds time. This function allows the user to select a display update rate most suitable for applications in which the rate input may be irregular.

7.46 Average display counts

Display: AUGE cnt
Range: 1 or 30
Default Value: 1

Only seen if r.AUG is selected at the FrEqrnGE function. Sets the number of time periods

counted over which the rolling average display will be calculated. For example if the AUGE SECS is set to 60 and the AUGE cnt is set to 10 then the rolling average displayed will be the average of the last ten 60 second averaged periods.

7.47 Input edge

Display: INPt EdGE
Range: rISE or FALL
Default Value: rISE

Displays and sets the pulse input edge on which triggering will occur. If set to rISE then the rising edge of the input pulse will trigger the input. If set to FALL then the falling edge of the input pulse will trigger the input. This function can be useful if one of the edges provides a better switching input than the other e.g. if there is a long rise time in the pulse input but a sharp fall time then select FALL as this will give a more definite pulse transition.

7.48 Remote input function

Display: r.I nP
Range: NONE, P.HLd, d.HLd, Hi , Lo, Hi Lo, ZErO, SP.Ac, No.Ac, di SP, duLL or 9.rSt
Default Value: NONE

When the remote input terminals are short circuited, via a pushbutton or keyswitch the instrument will perform the selected remote input function. A message will flash to indicate which function has been selected when the remote input pins are short circuited. The remote input functions are as follows:

NONE - no remote function required.

P.HLd - peak hold. The display will show the peak hold value whilst the remote input pins are short circuited.

d.HLd - display hold. The display will hold its value whilst the remote input pins are short circuited.

Hi - peak memory. The peak value stored in memory will be displayed if the remote input pins are short circuited, if the short circuit is momentary then the display will return to normal measurement after 20 seconds. If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

Lo - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the Hi function.

Hi Lo - toggle between Hi and Lo displays. This function allows the remote input to be used to toggle between peak and valley memory displays. The first operation of the remote input will cause the peak memory value to be displayed, the next operation will give a valley memory display. PHi or PLo will flash before each display to give an indication of display type. If the short circuit is held for 1 to 2 seconds then the memory will be cleared.

ZErO - zero the display. The total will be reset when the remote input is short circuited. If the c.rSt function is set to ZErO then the display will zero when reset. If the c.rSt function

is set to **P.SEt** then the display will go to the preset value when reset. This function is not applicable to rate or period displays.

SP.Ac - setpoint access only. This blocks access to any functions except the alarm setpoint functions unless the remote input pins are short circuited or entry is made via **CAL** mode.

no.Ac - no access. This blocks access to all functions unless the remote input pins are short circuited or entry is made via **CAL** mode.

di SP - display toggle. With the **SEt OPEr** function set to both this function will cause the display to toggle from the default display to the alternate display when the remote input pins are short circuited i.e allows toggling between the rate and total display. When the alternate display is being viewed a message will flash every 8 seconds to indicate that the alternate display is being shown e.g. if rate is the alternate display the message **rAtE** will be seen momentarily once every 8 seconds whilst the display is showing rate.

dULL - display brightness control. The remote input can be used to change the display brightness. When this mode is selected the display brightness can be switched, via the remote input, between the brightness level set at the **brGt** function and the brightness level set at the **dULL** function. Not applicable to electromagnetic displays.

G.rSt - grand total reset. This mode allows the remote input to be used as a reset input for the grand total seen in the **totl** and **both** modes.

7.49 P button function

Display: **P.but**
Range: **nonE**, **Hi** , **Lo**, **Hi Lo**, **2Er0**, **di SP**, **FUnC** or **G.rSt**
Default Value: **nonE**

The P button may be set to operate one chosen special function. This button is located on the main circuit board. With some functions, to prevent accidental operation, the P button must be held pressed for 2-3 seconds before the function will operate. If both the remote input and P button function are operated simultaneously the P button will override the remote input. The available functions, except for **FUnC**, are as described in the **r.i np** function above. The **FUnC** function is used only in totalising and can be used to adjust the preset value. When set to **FUnC** the message **P.SEt** will appear when the P button is pressed. The operator can then adjust the preset via the ▲ or ▼ button, F is then pressed to accept the change. A message **End** will be seen when the new preset value is accepted. When the total is next reset the display will reset to the new preset value if the **c.rSt** function is set to **P.SEt**.

7.50 Access mode

Display: **ACCS**
Range: **OFF**.**EASY**.**nonE** or **ALL**
Default Value: **OFF**

Access mode - the access mode function **ACCS** has four possible settings namely **OFF**.**EASY**. **nonE** and **ALL**. If set to **OFF** the mode function has no effect on alarm relay operation. If set to **EASY** the "easy alarm access" mode will be activated. Refer to "Easy alarm relay adjustment access facility" section. If set to **nonE** there will be no access to any functions via **FUnC** mode, entry via **CAL** mode must be made to gain access to alarm and calibration functions. If set to **ALL** then access to all functions, including calibration functions, can be gained via **FUnC** mode.

7.51 Setpoint access mode

Display: SPAC
Range: A 1, A 1-2 etc.
Default Value: A 1

Setpoint access - seen only if more than 1 relay fitted. Sets the access via FUNC mode and "easy alarm access" mode to the alarm relay setpoints. The following choices are available:
A 1 - Allows setpoint access to alarm 1 only.
A 1-2 - Allows setpoint access to alarms 1 and 2 only.
A 1-3 - Allows setpoint access to alarms 1, 2 and 3 etc. up to the maximum number of relays fitted.
The remote input function (r.1 nP) must be set to SP.AC for this function to operate. Note: Only the setpoints which have been given a value will be accessible e.g. if A 1H, is set to OFF then there will be no access to the A 1H, function when SPAC is used.

7.52 Alarm relay operation mode

Display: Ax.rt, Ax.tL or Ax.PS
Range: Ax.rt, Ax.tL or Ax.PS
Default Value: Ax.rt

This function is used to set the operation mode for alarm relays, the "x" indicates relay number e.g. A 1.rt. Choices available depend on the SEt OPEr function setting. With SEt OPEr set to both mode alarm relays can be set to operate as either a standard setpoint relay operating from rate when Ax.rt is selected or total when Ax.tL is selected or as a totliser "pass value" relay when Ax.PS is selected. In totL mode Ax.tL or Ax.PS may be selected. In FrEq mode this function will not appear.

With Ax.rt or Ax.tL the selected relay will operate from the high and/or low setpoints (AxH, and AxLo) and values for hysteresis, trip time, reset time, normally open/normally closed operation and setpoint or trailing alarms can also be set. The pass functions AxPS and AxPt will not be seen if the Ax.tL or Ax.rt mode is selected. With Ax.PS selected relay 1 will operate on a pass value i.e. it will operate on multiples of the AxPS value set. The setpoint functions AxLo, AxH, , AxHY, Axtt, Axrt, AxSP/AxtL will not be seen if the AxPS mode is selected.

7.53 Analog output operation mode

Display: rEC
Range: rAtE or totL
Default Value: rAtE

Seen only when the SEt OPEr function is set to both. Sets the operation mode for the optional analog retransmission. The output can be set to retransmit the total (totL or rate (rAtE).

7.54 Second analog output operation mode

Display: rEC2
Range: rAtE or totL
Default Value: rAtE

Seen only when the SEt OPEr function is set to both. Sets the operation mode for the second optional analog retransmission. The output can be set to retransmit the total (totL) or rate (rAtE).

7.55 Bargraph display operation mode

Display: bAr
Range: rAtE or totL
Default Value: rAtE

Seen only when SEt OPEr is set to both. Allows the choice of rate or total to be displayed on the bargraph in bargraph model displays.

7.56 Digital output operation mode

Display: d9OP
Range: rAtE or totL
Default Value: rAtE

Seen only when SEt OPEr is set to both. Allows the choice of rate or total to be output on the optional digital output.

7.57 Low overrange visual warning limit value

Display: Lo di SP
Range: Any display value or OFF
Default Value: OFF

Low overrange limit value - the display can be set to show an overrange message if the display value falls below the Lo di SP setting. For example if Lo di SP is set to 50 then once the display reading falls below 50 the message -or- will flash on and off or the display value will flash on and off instead of the normal display units (see di SP function 7.59). This message can be used to alert operators to the presence of an input which is below the low limit. If this function is not required it should be set to OFF by pressing the ⏏ and ⏷ buttons simultaneously at this function.

Note: this function operates on frequency/rate display only.

7.58 High overrange visual warning limit value

Display: HI 9H dI SP
Range: Any display value or OFF
Default Value: OFF

High overrange limit value - the display can be set to show an overrange message if the display value rises above the HI 9H dI SP setting. For example if HI 9H dI SP is set to 1000 then once the display reading rises above 1000 the message -or- will flash on and off or the display value will flash on and off instead of the normal display units (see dI SP function 7.59). This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to OFF by pressing the ▲ and ▼ buttons simultaneously at this function.

Note: this function operates on frequency/rate display only.

7.59 Display visual warning flashing mode

Display: dI SP
Range: FLSH or -or-
Default Value: FLSH

Display overrange warning flashing mode - this function is used in conjunction with the Lo dI SP and HI 9H dI SP functions. The dI SP function can be set to FLSH or -or-. If the display warning value set at the Lo dI SP or HI 9H dI SP function is exceeded and the dI SP function is set to FLSH then the display value will flash on and off every second as a visual warning. If the display warning value set at the Lo dI SP or HI 9H dI SP function is exceeded and the dI SP function is set to -or- then the -or- message will flash on and off once a second as a visual warning. The warning flashes will cease and the normal display value will be seen when the value displayed is higher than the low limit and lower than the high limit.

Note: this function operates on frequency/rate display only.

7.60 SET terminal input function

Display: S.I nP
Range: Lo or hi 9h
Default Value: hi 9h

Sets, in conjunction with the SET terminal input, the count up/down operation of the totaliser. The totaliser may be made to count up or count down via this function and if required made to toggle between up and down count mode using an external contact closure between SET and GND terminals. The S.I nP function and the SET terminal input connection may be used in one of the modes shown in the table below.

S.I nP Setting	SET terminal	Operation mode
Lo	Open i.e. no connection to SET terminal	Count down
Lo	Closed i.e. SET terminal shorted to GND terminal	Count up
hi 9h	Open i.e. not connection to SET terminal	Count up
hi 9h	Closed i.e. SET terminal shorted to GND terminal	Count down

7.61 Totaliser counter reset value

Display: c.rSt
Range: ZERO or PSEt
Default Value: ZERO

The reset terminal operation can be programmed to cause the display to reset to either zero or the selected preset value. Choose either ZERO or PSEt to select the required operation. PSEt is most commonly selected when the display is required to count down (S.i nP set to Lo) from a preset value.

7.62 Totaliser counter reset signal

Display: c.rSt
Range: Lo, LoE, Hi or Hi E
Default Value: Lo

Allows selection of reset level or edge to force a counter reset. If set to Lo a low input level or closed switch on the reset terminal will force a reset, the display will continuously reset whilst the input is low. If set to Hi a high input level or open switch on the reset terminal will force a reset, the display will continuously reset whilst the reset line is high. If set to LoE then a falling edge or switch closure on the reset terminal will force a reset. If set to Hi E then a rising edge or switch opening on the reset terminal will force a reset.

7.63 Totaliser counter reset value

Display: cntr rSt
Range: Any display value
Default Value: 0

The counter reset value function allows a number to be set at which the display will automatically reset. The automatic counter reset function can be disabled by setting the function to 0. This function is only applicable to upward counting applications i.e. the total is increasing. For example if cntr rSt is set to 100 and c.rSt is set to ZERO then when the display value reaches 99 the next input pulse will cause the instrument to automatically reset to 0. If the cntr rSt function is set to 0 then the display will not automatically reset and when the count has gone below the display limit the overrange warning message -or- will be seen. The only way to clear the overrange message is to reset the display.

7.64 Alarm 1 high reset

Display: A 1Hi rSt
Range: on or OFF
Default Value: OFF

Applies to relay 1 only. The alarm 1 high reset function allows the alarm operation to also cause an automatic total display reset. If the alarm mode is set to total (A 1tL) then when the display value reaches the value set at A 1Hi the relay will operate momentarily (the duration of the relay pulse can be extended via the A 1rt function if required). If the alarm mode is set to pass (A 1PS)

then the display will reset when the display value reaches the pass value (set at **A 1PS**) and the relay will activate and will remain activated for the time set at the **A 1Pt** function.

7.65 Default display

Display: **dFl t dl SP**
Range: **rAtE**, **PErd** or **totl**
Default Value: **rAtE**

Seen only in **both** mode. Sets the display default to either total or rate (or period if **dl SP** is set to **PErd**). The display will always revert to the default display on power up but can be forced to the alternate display via the **P** button or remote input (see **P.but** and **r.l nP** functions). If the alternate display is being viewed an identifier will flash briefly every 8 seconds approx. e.g. if the rate is the default display and the display is now toggled to show total the message **totl** will flash briefly every 8 seconds.

7.66 Set display operation

Display: **SEt OPEr**
Range: **S.Prd**, **PErd**, **FrE9**, **totL** or **both**
Default Value: **FrE9**

Displays and sets the selected operating mode, e.g. select **totL** for totaliser operation. Options are:

S.Prd - Not applicable to this instruction manual

PErd - Not applicable to this instruction manual

both - Frequency and total - allows toggling between rate and total display

totL - Total/counter display

FrE9 - Frequency/rate display

7.67 Baud rate for optional serial communications

Display: **bAUd rAtE**
Range: **300. 600. 1200. 2400. 4800. 9600. 19.2** or **38.4**
Default Value: **9600**

Set baud rate - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Select from **300. 600. 1200. 2400. 4800. 9600. 19.2** or **38.4** baud. The baud rate should be set to match the device being communicated with.

7.68 Parity for optional serial communications

Display: PrtY
Range: NONE, EVEN or odd
Default Value: NONE

Set parity - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Select parity check to either NONE, EVEN or odd. The parity should be set to match the device being communicated with.

7.69 Output mode for optional serial communications

Display: O.Put
Range: di SP, Cont, POLL, A.buS or M.buS
Default Value: Cont

Set serial interface mode - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Allows user to select the serial interface operation as follows:

di SP - sends image data from the display without conversion to ASCII.

Cont - sends 8 bit ASCII form of display data at a rate typically 90% of the sample rate.

POLL - controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as requested.

A.buS - is a special communications mode used with Windows compatible optional PC download software. Refer to the user manual supplied with this optional software.

M.buS - Modbus RTU protocol.

7.70 Instrument address for optional serial communications

Display: Addr
Range: 0 to 31
Default Value: 0

Set unit address for polled (POLL) or M.buS mode (0 to 31)) - seen only with serial output option. Refer to the separate "PM4 Panel Meter Optional Output Addendum" booklet supplied when optional outputs are fitted. Allows several units to operate on the same RS485 interface reporting on different areas etc. if RS485 is available. The host computer or PLC may poll each unit in turn supplying the appropriate address. The unit address ranges from 0 to 31 (DEC) but is offset by 32 (DEC) to avoid clashing with ASCII special function characters (such as <STX> and <CR>). Therefore 32 (DEC) or 20 (HEX) is address 0, 42 (DEC) or 2A (HEX) is address 10. Do not use address 0 in M.buS mode.

7.71 Returning to normal measure mode

When the calibration has been completed it is advisable to return the instrument to the normal mode (where calibration functions are less likely to be tampered with). To return to normal mode,

turn off power to the instrument, wait a few seconds and then restore power.

7.72 Examples

Example - RPM display

A proximity sensor connected to a flywheel produces 20 pulses per revolution. The instrument is required to display in RPM with 1 decimal point place. In this example 20 pulses per second would equal 1 revolution/sec which equals 60 RPM. The rAtE 1 nPt figure and rAtE SCLE figure could be 20 and 60.0 respectively but we will use 1 and 3.0 since they give the same ratio and hence will give the same reading on the display.

1. Follow the procedure shown on page 28 to enter the setup functions via CAL mode.
2. Step through the functions by pressing and releasing F until the rAtE dCPt function is seen.
3. Use the ▲ or ▼ push button to change the setting to 0.1.
4. Press F, the function rAtE 1 nPt will appear followed by the previous input value.
5. Use the ▲ or ▼ push button to alter the previous input value to the new input value of 1.
6. Press F, the function rAtE SCLE will appear followed by the previous scale value.
7. Use the ▲ or ▼ push button to alter the previous scale value to the new scale value of 3.0.
8. Press F to accept the change then either press P to exit of continue pressing and releasing F until the FUNC End message is seen and the unit returns to normal measure mode.

Example - Low frequency input rate display

A transducer is being used to give one pulse out for every bottle passing a point on a track. The display is required to show bottles per hour. The number of bottles passing can be as low as one every five seconds up to two per second. The rAtE 1 nPt value will be 1 and the rAtE SCLE value will be 3600 i.e. 1 bottle per second = 3600 bottles per hour. The procedure is as follows:

1. Follow the procedure shown on page 28 to enter the setup functions via CAL mode.
2. Step through the functions by pressing and releasing F until the FrEq rnGE function is seen.
3. Use the ▲ or ▼ push button to change the setting to LoF.
4. Step through the functions by pressing and releasing F until the t.out SECS function is seen.
5. Use the ▲ or ▼ push button to change the setting to a value greater than 5 seconds e.g. 8.
6. Step through the functions by pressing and releasing F until the rAtE 1 nPt function is seen.
7. Use the ▲ or ▼ push button to change the setting to 1.
8. Press F, the function rAtE SCLE will appear followed by the previous input value.

9. Use the ▲ or ▼ push button to change the setting to **3600**.
10. Press **F** to accept the change then either press **P** to exit of continue pressing and releasing **F** until the **FUNC End** message is seen and the unit returns to normal measure mode.

Example - Flow rate display

See previous examples for detailed steps showing how to alter functions. Flowmeters produce an output frequency proportional to the rate of flow the scaling is calculated using information provided by the manufacturer or from test results. e.g.: A turbine produces 767 pulses per litre

- to display litres/minute set **rAtE I nPt** to **767** and **rAtE SCLE** to **60**.
- to display litres/hour set **rAtE I nPt** to **767** and **rAtE SCLE** to **3600**.
- to display kilolitres/hour set **rAtE I nPt** to **7670** and **rAtE SCLE** to **36**.

Example - Low frequency input averaged rate display

In applications where the input rate is irregular it is sometimes preferable to show an averaged rate display. The averaged display will update at the end of the averaged period set at the **AVGE SECS** function and will therefore show less short term variation in the rate figure. In applications similar to the bottles/minute example above the **FrEq rnGE** function must be set to **AVGE** and instead of setting a **t.out SECS** time the **AVGE SECS** function would be used to set the required averaging period.

Example - rolling averaged rate display The rolling averaged rate display uses both the averaging rate (set by **AVGE SECS** and the average count (set **AVGE Cnt**) functions. For example if the with the **FrEq rnGE** function set to **r.AVG** (rolling average), the **AVGE SECS** function set to 300 (300 seconds or 5 minutes) and the **AVGE Cnt** (average count) function set to 12 the display will be averaged and updated every 5 minutes with each new update showing not the average of the last 5 minutes but the average of the last 12 x 5 minute (1 hour) time periods. For this example starting with a zero display a steady input scaled to read 1200 per hour would read 100 after the first 5 minutes, 200 after the second 5 minutes etc. up to 1200 after 1 hour (12 x 5 minutes). Beyond this time the display will update every 5 minutes showing the average over the last 12 x 5 minute time periods. The rate will be zeroed when the display is switched off of if the input stops for a sufficient time to allow the rate to fall to zero.

Example - Flowmeter totalising

A flowmeter produces 56 pulses per litre. The display us required to show total litres with 1 decimal point place. The procedure is as follows.

1. Follow the procedure shown on page 28 to enter the setup functions via **CAL** mode.
2. Step through the functions by pressing and releasing **F** until the **totl dCPt** function is seen followed by the previous decimal point setting.
3. Use the ▲ or ▼ push button to change the **totl dCPt** setting to **0.1**. Press **F** to accept the change.
4. Step through the functions by pressing and releasing **F** until the **totl I nPt** function followed by the previous input value is seen.
5. Use the ▲ or ▼ push button to alter the previous input value to the new input value of 56.
6. Press **F**, the function **totl SCLE** will appear followed by the previous scale value.

7. Use the ▲ or ▼ push button to alter the previous scale value to the new scale value of 1.

8. Press F to accept the change then either press P to exit of continue pressing and releasing F until the FUNC End message is seen and the display returns to normal measurement mode.

Example - Rotapulse flow sensor scaling

The "Rota pulse" paddle wheel flow meter (this sensor model is commonly used as an input rate/total displays) outputs approx. 36.5 pulses per linear metre flow of liquid in a pipe. In this example we will assume that the pipe internal diameter is 50mm (25mm or 0.025m radius).

The steps to calculate the scaling of the meter for this example are as follows:

1. Calculate the area of the pipe in square metres:

$$\text{Area} = \pi \times r^2 = \pi \times 0.025^2 = 0.00196\text{m}^2$$

2. Calculate the volume of a 1m length of pipe:

$$\text{Volume} = \text{Area} \times \text{Length} = 0.00196 \times 1 = 0.00196\text{m}^3$$

3. For every 36.5 pulses we therefore have 0.00196 cubic metres of liquid or 1.96 litres of liquid (there are 1000 litres in one cubic metre). For a litres/sec display we could therefore have scaling factors of RATE1 MPL = 3650 and RATE SCLE = 196.

The table below shows typical rate scaling factors for this flowmeter. Note that the examples in the table can be reduced to smaller numbers as long as the ratio between the two numbers are the same. The scaling factors above are approximate and will vary depending on pipe size and installation conditions. A calibration should be carried out to determine the correct scaling for any installation where accuracy is required

Rate table for Rota Pulse flow meter with 36.5 pulses per metre flow				
Pipe dia.	Litres/sec	Litres/min	Litres/hour	m^3/hr
25mm	RATE1 MPL=3650 RATE SCLE=49	RATE1 MPL=365 RATE SCLE=295	RATE1 MPL=365 RATE SCLE=17640	RATE1 MPL=36500 RATE SCLE=1764
40mm	RATE1 MPL=3650 RATE SCLE=126	RATE1 MPL=365 RATE SCLE=756	RATE1 MPL=365 RATE SCLE=45360	RATE1 MPL=365 RATE SCLE=45
50mm	RATE1 MPL=3650 RATE SCLE=196	RATE1 MPL=365 RATE SCLE=1176	RATE1 MPL=365 RATE SCLE=70560	RATE1 MPL=365 RATE SCLE=71
80mm	RATE1 MPL=3650 RATE SCLE=503	RATE1 MPL=365 RATE SCLE=3018	RATE1 MPL=365 RATE SCLE=181080	RATE1 MPL=365 RATE SCLE=181
100mm	RATE1 MPL=3650 RATE SCLE=785	RATE1 MPL=365 RATE SCLE=4710	RATE1 MPL=365 RATE SCLE=282600	RATE1 MPL=365 RATE SCLE=281
150mm	RATE1 MPL=365 RATE SCLE=177	RATE1 MPL=365 RATE SCLE=10620	RATE1 MPL=365 RATE SCLE=637200	RATE1 MPL=365 RATE SCLE=637

The table below shows typical total scaling factors for this flowmeter. Note that the examples in the table can be reduced to smaller numbers as long as the ratio between the two numbers are the same. The scaling factors above are approximate and will vary depending on pipe size and installation conditions. A calibration should be carried out to determine the correct scaling for any installation where accuracy is required

Total table for Rota Pulse flow meter with 36.5 pulses per metre flow		
Pipe dia.	Litres	Kilolitres or m^3
25mm	tot1 1 dPt = 74316 tot1 SCLE = 1000	tot1 1 dPt = 74316 tot1 SCLE = 1
40mm	tot1 1 dPt = 29029 tot1 SCLE = 1000	tot1 1 dPt = 29029 tot1 SCLE = 1
50mm	tot1 1 dPt = 18579 tot1 SCLE = 1000	tot1 1 dPt = 18579 tot1 SCLE = 1
80mm	tot1 1 dPt = 7257 tot1 SCLE = 1000	tot1 1 dPt = 7257 tot1 SCLE = 1
100mm	tot1 1 dPt = 4645 tot1 SCLE = 1000	tot1 1 dPt = 4645 tot1 SCLE = 1
150mm	tot1 1 dPt = 2064 tot1 SCLE = 1000	tot1 1 dPt = 2064 tot1 SCLE = 1

7.73 Error messages and fault finding

Display shows -or- - this message indicates either that the number is too big to display e.g. above 9999 on a 4 digit display or that the di SP function has been set to -or- and either the Lo di SP or HI 9H di SP limits have been exceeded. For a totaliser display this message indicates that the total is too large to display and the total will need to be reset.

Display value flashes on and off - this indicates that the di SP function has been set to FLSH and either the Lo di SP or HI 9H di SP limits have been exceeded.

Display shows no ACC - this indicates that the ACCS function has been set to none or the F.1 nP function has been set to no.Ac blocking entry to FUNC mode. Enter functions via CAL mode to gain entry to functions and if required change the ACCS or F.1 nP function setting.

Display shows no SPAC - this indicates that the F.1 nP function has been set to SP.Ac blocking entry to alarm relay functions. Enter functions via CAL mode to gain entry to functions and if required change the F.1 nP function setting.

Fault finding - Most fault finding occurs during initial setup and consists of selection of the correct operation mode, correct scaling of the display for the display units required and setting of the electrical input links to match the sensor used. A brief checklist is given below.

1. Check that the correct display mode has been chosen at the SEt OPEr function 7.66.
2. Check that the correct input links have been set to suit the input sensor, see page 7.
3. Check that a suitable pulse is being received. See "Notes" on page 9. If necessary measure the pulse high and low levels to ensure the sensor output is suitable.
4. If the totaliser dispaly does not increment when pulses are applied check the c.rSt function and the state of the reset input to ensure that the display is not in continuous reset.

8 Specifications

8.1 Technical specifications

Total/Rate input:	Link selectable for various sensor types, see section 3.7. Maximum input voltage is 48VDC or RMS with appropriate link settings.
Totaliser functions:	Scaleable up or down counter. Total and grand total memory.
Ratemeter functions:	Scaleable rate display. Period display available when low frequency input range is selected.
Accuracy:	Better than 0.01% for rate indication (0.01% ±10uS for period)
Impedance:	10kΩ
Max. count rate:	100kHz
Memory retention:	Battery backed totaliser memory
Totaliser reset:	Contact closure (or 5V control voltage) across terminals 7 and 9. Grand total reset via contact closure across terminals 7 and 8. Note: **F.1 nP** function must be set to **9.rSt** if grand total reset operation is required.
Microprocessor:	HC68HC11 CMOS
Ambient temperature:	LED -10 to 60^o C, LCD -10 to 50^o C
Humidity:	5 to 95% non condensing
Display:	LED Models: 4 digit 20mm, 5 digit 14.2mm + status LEDs + 4 way keypad. 6 digit 14.2mm + 4 way keypad LCD Models: 4 digit 12.7mm, 6 digit 12.7mm
Power Supply:	AC 240V, 110V or 24V 50/60Hz or DC isolated wide range 12 to 48V. Note: supply type is factory configured.
Power Consumption:	AC supply 4 VA max, DC supply typically 160mA at 12VDC and 80mA at 24VDC for PM4 with no optional outputs, actual current drawn depends on display type and options fitted
Sensor supply:	25mA max. link selectable as 5VDC regulated or 9VDC or 18VDC unregulated (the 9 and 18V supplies are only available on AC powered displays)
Output (standard):	1 x relay, Form A, rated 5A resistive
Relay Action:	Programmable N.O. or N.C or PI control (frequency or pulse width)

8.2 Optional outputs

Extra Relays:	Same specs. as Relay 1 (up to 6 extra relays). Available as one, three or six extra relays.
Analog Retransmission:	12 bit isolated 4 to 20mA, 0 to 1V or 0 to 10V link selectable (single or dual analog output versions available). (4-20mA will drive into resistive loads of up to 800Ω)
Serial Communications:	Isolated RS232 or RS485 (ASCII or Modbus RTU)

8.3 Physical Characteristics

Bezel Size:	DIN 48mm x 96mm x 10mm
Case Size:	44mm x 91mm x 120mm behind face of panel
Panel Cut Out:	45mm x 92mm +1mm/-0mm
Connections:	Plug in screw terminals (max. 2.5mm^2 wire)
Weight:	400 gms basic model, 450 gms with option card

9 Guarantee and service

The product supplied with this manual is guaranteed against faulty workmanship for a period of two years from the date of dispatch.

Our obligation assumed under this guarantee is limited to the replacement of parts which, by our examination, are proved to be defective and have not been misused, carelessly handled, defaced or damaged due to incorrect installation. This guarantee is VOID where the unit has been opened, tampered with or if repairs have been made or attempted by anyone except an authorised representative of the manufacturing company.

Products for attention under guarantee (unless otherwise agreed) must be returned to the manufacturer freight paid and, if accepted for free repair, will be returned to the customers address in Australia free of charge.

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given. In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product.

Modifications may be made to any existing or future models of the unit as it may deem necessary without incurring any obligation to incorporate such modifications in units previously sold or to which this guarantee may relate.

This product is designed and manufactured in Australia.